

Singapore and ASEAN Schools Math Olympiads (SASMO)

2013

Middle Primary 3 and 4

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V. Math Olympiad Challenges

Question 1

Find the number A such that the following statement is true:

$$5 \times 10 + 6 \times 10 = 11 \times A$$

Question 2

What is the missing number B which satisfies the given equation?

$$2 \times B + 5 \times 4 - 14 = B + 3 \times 2 + 6$$

Question 3

Suppose N is a whole number. For how many values of N less than 150 is

$\frac{N}{10} + \frac{N}{20}$ also a whole number?

Question 4

For how many values of N is $\frac{144}{N^2}$ also a whole number?

Question 5

A bag contains a total of 15 balls of 5 different colours. Each colour has a unique number of balls in the bag. What is the least number of balls to be picked (without looking) to ensure three different coloured balls are picked?

Question 6

Seven 50 ¢ coins and eight \$1 coins are equally distributed (randomly) among five children. What is the difference between the maximum amount and the minimum amount a child can receive? (Give your answer in dollars)

Question 7

A *palindromic number* is a number that remains the same when its digits are reversed. E.g. 4554 is a palindromic number. How many palindromic numbers are there between 100 and 999, inclusive?



Question 8

If two different natural numbers have the same digits but in reverse order, each number is called the *palimage* of the other. For example, 12 and 21 are palimages of each other. What is the maximum difference between two-digit palimages?

Question 9

Alan runs at a rate of 100 meters per 15 seconds. At this rate, how much distance will he cover in 15 minutes? Give your answer in kilometers.

Question 10

In a construction company, 10 workers complete one-tenth of their total in 10 hours. How long will 50 workers take to complete their entire work?

Question 11

If January 1st, 2005 was a Monday, on what date will the 55th Monday from January 1st, 2005 be?

Question 12

The average of 5 numbers is 7.6. What number should be added to increase the average of the number to 8?

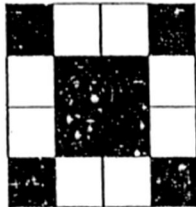
Question 13

In the following pattern, how many black squares are there in the 19th image?

1st Image



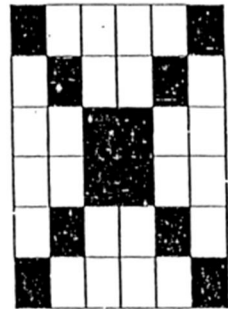
2nd Image



3rd Image



4th Image

**Question 14**

A certain number of children stand in a line in ascending height order. The 10th child from the front is also the 16th child from the back. How many children must be added at the back such that the 5th child from the front becomes the 36th child from the back?

Question 15

Among a certain group of kids, the first kid gets 1 sweet, the second kid gets 2 more sweets than the first kid, the third kid gets 3 more sweets than the second kid and so on. How many more sweets does the 12th kid get in comparison to the 6th kid?

Question 16

Rico walks from point A to point B on a straight path at a speed of 2 km/h. Alice walks from point B to point A on the same path at a speed of 5 km/h. If Rico starts walking from point A at the same time as Alice starts walking from point B, and the distance between points A and B is 14 km, how far would Alice have walked before she crosses Rico?

Question 17

How many degrees does the minute hand sweep between the time 9:00 AM and 11:50 AM?

Question 18

A, B, C are different numbers to be chosen from the set {4, 7, 8, 10}. Find the difference between the largest and smallest values of

$$\frac{A \times B}{C}$$

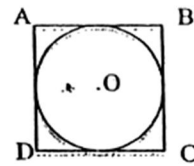
Question 19

Given on the right is a series of numbers following a specific pattern. (1,2) refers to the number in the first row second column. What is the number in (10,2)?

R o w	Column		
	2	4	6
	9	12	15
	17	19	21
	24	27	30

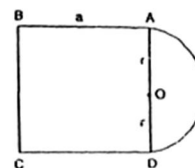
Question 20

A circle with centre O is inscribed in a square $ABCD$ as shown in the figure. If the perimeter of square $ABCD$ is 16 cm, find the area of the circle in cm^2 .
Give your answer in terms of cm^2 .



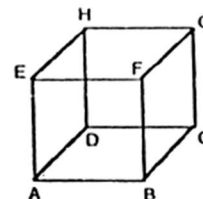
Question 21

In the given figure, arc AOD represents a semicircle. With centre at O . Length of $AB = a$ where $ABCD$ is a square. Find the area of the given figure.



Question 22

Let $ABCDEFGH$ be a cuboid such that $AB = 10\text{ cm}$, $BC = 2\text{ cm}$, $BF = 5\text{ cm}$. How many cubes of length $\frac{1}{2}\text{ cm}$ would be required to fill the cuboid?



Question 23

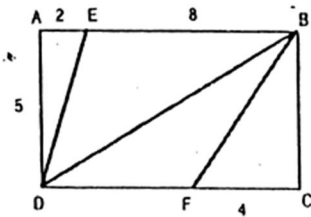
Given $C > 0$, for how many values of B is the given product valid?

$$\begin{array}{r} \text{AA} \\ \times \text{CB} \\ \hline \text{BB} \\ \text{CC0} \\ \hline \text{C5B} \end{array}$$

Question 24

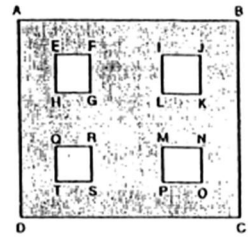
If BD is a diagonal in a rectangle $ABCD$ where $AB = 10$, $AD = 5$, $AE = 2$, $FC = 4$ as shown in the figure, find the value of:

$$\frac{\text{Area of triangle AED}}{\text{Area of triangle BED}} + \frac{\text{Area of triangle BCF}}{\text{Area of triangle BFD}}$$



Question 25

ABCD is a square park where $AB = 100$ m. The shaded area represents grass and the solid areas represent congruent squares of concrete. If $EF = 5$ m, what is the ratio of the area covered by grass to the area covered by concrete?



Question 26

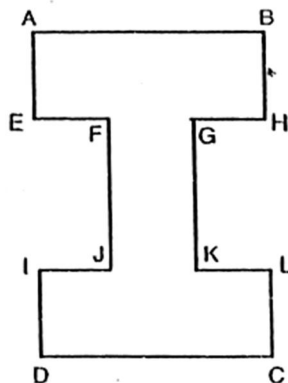
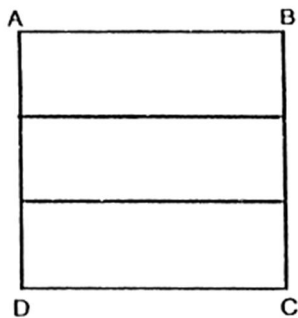
Andy's current age is 40. Five years from now, his age will be equal to the sum of the ages of his two sons, Mike and Rick. If Mike is 3 years older than Rick, what is Rick's current age?

Question 27

A 3×3 grid contains 9 numbers. Each number is halved to obtain the number on the left. Each number is multiplied by $\frac{1}{3}$ to obtain the number above. If the sum of the numbers is 182, what is the number in the top right corner?

Question 28

A square is divided into three congruent rectangles as shown in figure 1. If the middle rectangle is rearranged to form figure 2, what is the ratio of the perimeter of figure 1 to the perimeter of figure 2?



Question 29

In the zoo, there are 45 heads of monkeys and lions. There are twice as many monkeys as lions. How many lions are there?

Question 30

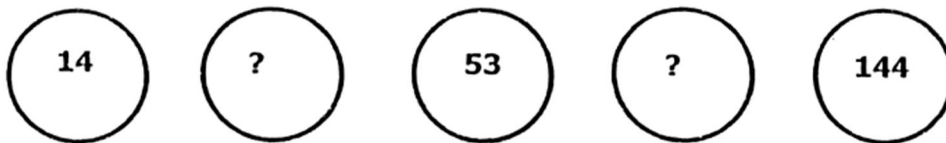
In a group of 35 students, there are 9 girls more than boys. What is the number of girls?

Question 31

Jason has eaten 45 chocolates in 5 days. Every day, he ate 2 chocolates more than the previous day. How many chocolates did he eat on the first day?

Question 32


Find missing number and complete the number pattern.



Question 33

The sum of Tom's age and Jerry's age is 25. What will the sum of their ages be after nine years?

Question 34

The  (star) has a number value of?

$$\bigcirc + \triangle = 26$$

$$\triangle + \triangle = 34$$

$$\triangle + \square = 35$$

$$\bigcirc + \square = \star$$

Question 35

There were 17 pieces of paper. Some of them were cut into four parts. Altogether, there are now 32 pieces of paper. How many pieces were cut into four parts?

Question 36

What is the smallest possible number of children in a family if each child has at least two brothers and two sisters?

Question 37

In a box, there are six smaller boxes, each one of them contains seven even smaller boxes. How many boxes are there in total?

Question 38

What is the value of the following?

$$\begin{aligned} &75 + 75 + 75 + 75 + 75 + \\ &75 + 75 + 75 + 75 + 75 + \\ &75 + 75 + 75 + 75 + 75 + \\ &75 + 75 + 75 + 75 + 75 + \\ &75 + 75 + 75 + 75 \end{aligned}$$

Question 39

Observe the following number pattern and fill in the box with the correct answer.

11	35
1645	

32	46
3966	

34	25
?	

Question 40

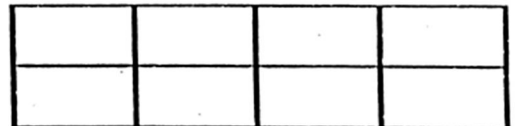
There are 47 boys and 29 girls in a group. Every week, 6 more boys and 9 more girls join the group. After how many weeks will there be the same number of boys and girls in the group?

Question 41

A box has five pens in five colours: red, green, blue, white and yellow. The green pen is the first pen on the left. The yellow pen is next to the green pen and the red pen. The white pen is next to the red pen and the blue pen. What is the order of the pens in that box?

Question 42

How many rectangles are in this picture?



Question 43

What is the next number in the following pattern

1, 3, 11, 123, ?

Question 44

There are parrots and rabbits in a pet store. The number of parrots is 50 more than that of rabbits and the total number of legs of the parrots is 40 more than that of the rabbits. How many parrots are there in the pet store?

Question 45

How many three-digit numbers are there in which all digits on the left are larger than digits on the right? (Hint: Look for a pattern)

Singapore and Asian Schools Math Olympiad (SASMO)

2014-2015

Primary 3

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SASMO 2014 Primary 3 [20 non-MCQ]

Questions 1 to 10 [1 point for each question]

1. Jane is 9 years old and John is 5 years old. How old will John be when Jane is 15 years old?

2. A textbook is opened at random. To what pages is it opened if the product of the facing pages is 110?

3. Find the number B such that the following statement is true:
$$8 \times B = 3 \times 9 + 5 \times 9.$$

4. It is given that $a \otimes b = a \times b + a - b$. For example, $2 \otimes 3 = 2 \times 3 + 2 - 3 = 5$. Find the value of $4 \otimes 3 - 3 \otimes 4$.

5. Jane has a rope of length 23 cm. She wants to cut the rope so that she can form the biggest possible square, where the length of each side, in cm, is a whole number. What is the length of the rope that she must cut to form the square?

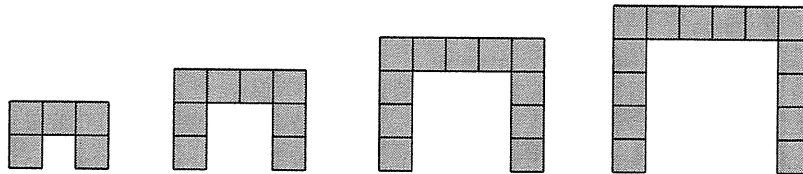
6. Find the missing term in the following sequence:
 $1, 2, 6, 24, \underline{\hspace{1cm}}, 720.$

7. On National Day, 39 soldiers lined up in a straight row on opposite sides of Stadium Street to welcome Prime Minister Lee. A soldier stands on each end of Stadium Street. The distance between two adjacent soldiers on either side was 20 m. The soldiers on one side were arranged such that each soldier filled the gap between two other soldiers on the opposite side. How long was Stadium Street?

8. A shop sells sweets where every 3 sweet wrappers can be exchanged for one more sweet. Sharon has enough money to buy only 11 sweets. What is the biggest number of sweets that she can get from the shop?

9. At a workshop, there are 10 participants. Each of them shakes hand once with one another. How many handshakes are there?
-

10. Ali uses identical square tiles to make the following figures. If he continues using the same pattern, how many tiles will there be in the 15th figure?



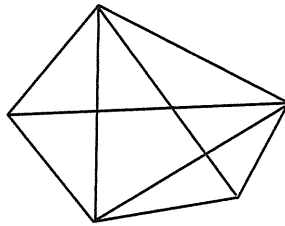
-
11. What is the least number of cuts required to cut 16 identical sausages so that they can be shared equally among 24 people?
-
12. A vending machine accepts 10¢ coins, 20¢ coins, 50¢ coins and \$1 coins only. Ivy wants to buy a can of drinks that costs \$1.60. She has eight 10¢ coins, three 20¢ coins, two 50¢ coins and one \$1 coin. If she wants to get rid of as many coins as possible, what is the combination of coins that she should put inside the vending machine?
-
13. The total cost of a pen and a pencil is \$2.90. The pen costs 60¢ more than the pencil. What much does the pen cost?
-
14. If the three-digit number 3N3 is divided by 9, the remainder is 1. Find N.
-
15. Charles has 16 marbles. He divides them into 4 piles so that each pile has a different number of marbles. Find the smallest possible number of marbles in the biggest pile.

Questions 16 to 20 [2 points for each question]

16. In the following alphametic, all the different letters stand for different digits. Find the three-digit sum SEE.

$$\begin{array}{r} A S \\ + A \\ \hline S E E \\ \hline \end{array}$$

-
17. Find the total number of triangles in the diagram.



-
18. A teacher has a bag of sweets to treat her class. If she gave 5 sweets to each student, then she would have 40 sweets left. If she gave 7 sweets to each student, then she would have 6 sweets left. How many students and how many sweets are there?

-
19. What are the last 2 digits of the sum $1 + 11 + 111 + \dots + \underbrace{111\dots111}_{50 \text{ digits}}$?

-
20. Alvin tells the truth on Monday, Tuesday, Wednesday and Thursday. He lies on all other days. Doris tells the truth on Monday, Friday, Saturday and Sunday. She lies on all other days. One day they both said, "Yesterday I lied." When was that 'one day'?

End of paper

SASMO 2014 Primary 3 Solutions

Section A

Question 1

Method 1

Jane will be 15 years old in $15 - 9 = 6$ years' time.

John will be $6 + 5 = \mathbf{11}$ years old.

Method 2

Difference in age between Jane and John = $9 - 5 = 4$ years

When Jane is 15 years old, John will be $15 - 4 = \mathbf{11}$ years old.

Question 2

Since $10 \times 10 = 100$, try $10 \times 11 = 110$. The pages are **10 and 11**.

Question 3

Method 1

$$8 \times B = 3 \times 9 + 5 \times 9 = 27 + 45 = 72$$

$$A = 72 \div 8 = \mathbf{9}$$

Method 2

$$8 \times B = 3 \times 9 + 5 \times 9 = (3 + 5) \times 9 = 8 \times 9$$

$$A = \mathbf{9}$$

Question 4

Method 1

$$4 \otimes 3 = 4 \times 3 + 4 - 3 = 13$$

$$3 \otimes 4 = 3 \times 4 + 3 - 4 = 11$$

$$4 \otimes 3 - 3 \otimes 4 = 13 - 11 = \mathbf{2}$$

Method 2

$$4 \otimes 3 = 4 \times 3 + 4 - 3 = 4 \times 3 + 1$$

$$3 \otimes 4 = 3 \times 4 + 3 - 4 = 3 \times 4 - 1$$

$$4 \otimes 3 - 3 \otimes 4 = 1 - (-1) = \mathbf{2}$$

Question 5

Since $5 \text{ cm} \times 4 = 20 \text{ cm}$, and $6 \text{ cm} \times 4 = 24 \text{ cm}$, then the biggest possible square that she can form has a length of 5 cm. The length of rope that she must cut to form the square = $5 \text{ cm} \times 4 = \mathbf{20 \text{ cm}}$

Question 6

The pattern is as follows:

$$\begin{array}{ccccccc} 1, & 2, & 6, & 24, & \text{---}, & 720 \\ \uparrow & \uparrow & \uparrow & \uparrow & \uparrow & \\ \times 2 & \times 3 & \times 4 & \times 5 & \times 6 & \end{array}$$

The missing term is $24 \times 5 = \mathbf{120}$.

Question 7

There are 20 soldiers on one side and 19 soldiers on the other side.

The length of Stadium Street = $20 \text{ m} \times (20 - 1) \text{ gaps} = \mathbf{380 \text{ m}}$

Question 8

11 sweets \rightarrow 11 wrappers \rightarrow **3 sweets** and 2 wrappers \rightarrow 5 wrappers \rightarrow **1 sweet** and 2 wrappers \rightarrow 3 wrappers \rightarrow **1 sweet**

The biggest no. of sweets = $11 + 3 + 1 + 1 = \mathbf{16}$ [Common mistakes: 14, 15]

Question 9

The first participant will shake hand with 9 other participants;

the second participant will shake hand with 8 other participants;

the third participant will shake hand with 7 other participants; etc.

Thus total no. of handshakes = $9 + 8 + 7 + \dots + 3 + 2 + 1$

$$\left. \begin{array}{l} 1 + 9 = 10 \\ 2 + 8 = 10 \\ 3 + 7 = 10 \\ 4 + 6 = 10 \end{array} \right\} \begin{array}{l} 4 \text{ pairs} \\ 5 \end{array}$$

Total number of handshakes = $10 \times 4 + 5 = \mathbf{45}$

Question 10

Method 1

The two corner tiles are the same for all figures.

The 15th figure will have $15 \times 3 + 2 = \mathbf{47}$ tiles.

Method 2

The tiles in the top row have this pattern: 3, 4, 5, 6, ...

The 15th figure will have $17 + 2 \times 15 = \mathbf{47}$ tiles.

Method 3

The tiles in each of the vertical column have this pattern: 2, 3, 4, 5, ...

The 15th figure will have $16 \times 2 + 15 = \mathbf{47}$ tiles.

Method 4

The no. of tiles in each figure is equal to the "area of the rectangle" minus the "area of the hole in the middle".

The pattern for the "area of the rectangle" is $2 \times 3, 3 \times 4, 4 \times 5, 5 \times 6, \dots$

The pattern for the "area of the hole in the middle" is $1 \times 1, 2 \times 2, 3 \times 3, 4 \times 4, \dots$

The 15th figure will have $16 \times 17 - 15 \times 15 = 272 - 225 = \mathbf{47}$ tiles.

Question 11

Fraction of sausage each person will get $= \frac{16}{24} = \frac{2}{3}$

This means that there must be at least 16 cuts since no one will get one whole sausage.

Cut each of the 16 sausages at the $\frac{2}{3}$ -mark. Then 16 people will get one $\frac{2}{3}$ sausage each, and the remaining 8 people will get two $\frac{1}{3}$ sausages each.

The least no. of cuts = **16**

Question 12

To get rid of as many coins as possible, we try to use as many coins with the smallest value (i.e. the 10¢ coins) as possible.

If Ivy uses all the eight 10¢ coins, then what is left is $\$1.60 - 80¢ = 80¢$.

Unfortunately, Ivy has only three 20¢ coins, which is not enough.

So she has to use a 50¢ coin.

But $50¢ + 20¢ = 70¢$, which is $10¢$ short.

In other words, she can't use all the eight $10¢$ coins.

She has to use **seven $10¢$ coins, one $50¢$ coin and two $20¢$ coins.**

Question 13

Method 1 (Systematic Guess and Check)

Make a systematic list, starting with a random guess: pencil costs \$1 and pen costs \$1.60.

Cost of Pencil	Cost of Pen	Total Cost
\$1	\$1.60	\$2.60
\$1.10	\$1.70	\$2.80
\$1.15	\$1.75	\$2.90

The pen costs **\$1.75**

Method 2 (Model Method)

Pen	<input type="text"/>	60¢	} \$2.90
Pencil	<input type="text"/>		

$$2 \text{ units} = \$2.90 - 60¢ = \$2.30$$

$$1 \text{ unit} = \$1.15$$

The pen costs $\$1.15 + 60¢ = \mathbf{\$1.75}$

Method 3 (Algebraic Method)

Let the cost of the pencil be $\$x$.

Then the cost of the pen is $\$(x + 0.6)$.

$$\text{So } x + (x + 0.6) = 2.9$$

$$2x + 0.6 = 2.9$$

$$2x = 2.3$$

$$x = 1.15$$

The pen costs $\$(1.15 + 0.60) = \mathbf{\$1.75}$

Question 14

Since $3N3$ gives a remainder of 1 when divided by 9, then $3N3 - 1 = 3N2$ is divisible by 9.

Using the divisibility test for 9, $3 + N + 2 = N + 5$ is also divisible by 9. **$N = 4$.**

For each pile to have a different number of marbles, and the biggest pile to have the smallest possible number of marbles, put 1 marble in the 1st pile, 2 marbles in the 2nd pile, 3 marbles in the 3rd pile and 4 marbles in the 4th pile. So the biggest pile is the 4th pile, but there are only $1 + 2 + 3 + 4 = 10$ marbles.

The 15th marble will go to the 4th pile again, and the 16th marble to the 3rd pile.
The largest pile (which is the 4th pile) will contain $4 + 1 + 1 = \mathbf{6 \text{ marbles}}$.

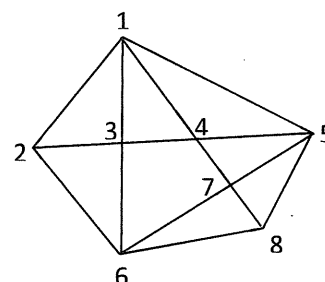
Question 16

Since the addition of two digits will give a maximum of 18, or a maximum of 19 if there is a carryover (or renaming) of 1, this means that the maximum carryover is 1.

So **A = 9** and there is a carryover of 1 for A to give 10, i.e. **S = 1** and **E = 0**.

$91 + 9 = 100$, i.e. the three-digit sum SEE is **100**.

Label the vertices as shown in the diagram.
These are the vertices that form a triangle:
123, 124, 125, 126, 134, 135, 145, 156, 157, 158,
167, 168, 236, 256, 356, 457, 458, 568, 578, 678.
There is a total of **20 triangles** in the diagram.



If the teacher gave 5 sweets to each student, then she would have 40 sweets left.
From the 40 sweets left, if she gave 2 more sweets to each student so that each student has 7 sweets, then she would have 6 left.

This means that she gave a total of $40 - 6 = 34$ sweets from the 40 sweets left to the students.

Since each student receives only 2 more sweets (i.e. the 6th and 7th sweets), then there are $34 \div 2 = \mathbf{17 \text{ students}}$.

There are $17 \times 7 + 6 = \mathbf{125 \text{ sweets}}$.

Question 19

Last digit: $50 \rightarrow 0$ (and carry 5)

Second last digit: $49 + 5$ (carry) $= 54 \rightarrow 4$

The last 2 digits are **40**.

Question 20

	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Alvin	✓	✓	✓	✓			
Doris	✓				✓	✓	✓

✓ indicates the person telling the truth

If Alvin tells the truth on that 'one day' that he lied 'yesterday', then that 'one day' must be Monday.

If Alvin tells the lie on that 'one day' that he lied 'yesterday', then he must be telling the truth 'yesterday' and so that 'one day' must be Friday.

Based on Alvin, it has to be either Monday or Friday.

If Carol tells the truth on that 'one day' that she lied 'yesterday', then that 'one day' must be Friday.

If Carol tells the lie on that 'one day' that she lied 'yesterday', then she must be telling the truth 'yesterday' and so that 'one day' must be Tuesday.

Based on Carol, it has to be either Tuesday or Friday.

Hence, that 'one day', when they both said that they lied 'yesterday', has to be **Friday**.

SASMO 2015 Primary 3 [10 MCQ + 10 non-MCQ = 20 Q]

Section A (Correct answer = 2 marks; no answer = 0; incorrect answer = minus 1 mark)

1. Find the missing term in the following sequence: 1, 2, 4, 7, _____, 16.

- (a) 10
- (b) 11
- (c) 12
- (d) 13
- (e) 14

2. 2^5 means 2 multiplied by itself 5 times, i.e. $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$. What is 3^4 equal to?

- (a) 7
- (b) 12
- (c) 27
- (d) 81
- (e) None of the above

3. An operator \star acts on two numbers to give the following outcomes:

$$3 \star 2 = 51$$

$$5 \star 3 = 82$$

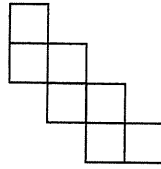
$$6 \star 1 = 75$$

$$9 \star 4 = 135$$

What is $7 \star 5$ equal to?

- (a) 112
- (b) 121
- (c) 122
- (d) 212
- (e) None of the above

4. The diagram shows a figure that contains 7 identical squares. The area of the figure is 112 cm^2 . Find its perimeter.

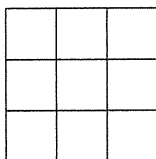


- (a) 56 cm
(b) 60 cm
(c) 64 cm
(d) 68 cm
(e) 72 cm
-
5. Fill in the blank: _____ is 4 tens 5 ones greater than 2 tens 7 ones.
- (a) 18
(b) 28
(c) 62
(d) 72
(e) None of the above
-
6. Which of the following statement(s) is or are correct?
- Statement A: $7 + (0 \times 2) = 7$
Statement B: $7 + (0 \div 2) = 7$
Statement C: $7 + (2 \times 0) = 7$
- (a) All the three statements are correct.
(b) Only Statements A and B are correct.
(c) Only Statements A and C are correct.
(d) Only Statements B and C are correct.
(e) None of the above

7. There are 4 types of cakes available in a cake shop: chocolate, cheese, blueberry and blackforest. Naomi wants to buy 2 different types of cakes. How many different choices does she have?

- (a) 4
- (b) 6
- (c) 8
- (d) 10
- (e) 12

-
8. Find the total number of squares in a 3×3 square grid.



- (a) 9
- (b) 10
- (c) 13
- (d) 14
- (e) 15

-
9. Find the smallest whole number between 14 and 40 that is divisible by 3 and by 4.

- (a) 12
- (b) 16
- (c) 18
- (d) 24
- (e) 36

10. What is the length of the largest square that can be made from 50 one-centimetre square tiles?
- (a) 5 cm
 - (b) 6 cm
 - (c) 7 cm
 - (d) 8 cm
 - (e) None of the above

Section B (Correct answer = 4 marks; incorrect or no answer = 0)

11. Two numbers are such that
- the first number is greater than or equal to 5, but less than or equal to 8
 - the second number is greater than or equal to 2, but less than or equal to 10.
- Find the least possible value of the sum of the two numbers.

-
12. If the four-digit number $12N4$ is divisible by 3 and N is less than 5, find N .

-
13. A whole number multiplied by itself will give a special type of numbers called perfect squares. Examples of perfect squares are $9 (= 3 \times 3)$ and $16 (= 4 \times 4)$. What is the smallest number that can be multiplied by 28 to give a perfect square?

-
14. Find the day of the week that is 50 days from a Monday.

-
15. Amy wants to cut rectangular cards of length 4 cm by 3 cm from a rectangular sheet 32 cm by 21 cm. Find the biggest number of cards that can be cut from the sheet.

-
16. There are 5 items (a ruler, a pen, an eraser, a sharpener and a hole puncher) lying in a straight row on a table. The eraser is next to the hole puncher and the sharpener. The ruler is next to the hole puncher. The sharpener is the first item on the left. What is the order of the items on the table from left to right?

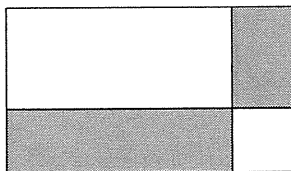
17. In the following, all the different letters stand for different digits. Find the two-digit NO.

$$\begin{array}{r}
 \text{N O N} \\
 - \quad \text{A N} \\
 \hline
 \text{N O} \\
 \hline
 \end{array}$$

18. 50 cakes are packed in two different box sizes. The small box holds 4 cakes and the big box holds 6 cakes. If less than 10 boxes are used and all the boxes are fully packed, how many big boxes are used?

19. Alice and Ben are sister and brother. Alice has as many sisters as she has brothers, but Ben has twice as many sisters as he has brothers. How many boys and girls are there in their family?

20. The diagram shows a rectangle being divided into 3 smaller rectangles and a square. If the perimeter of the unshaded rectangle is 16 cm and the area of the square is 9 cm², find the total area of the shaded rectangles.



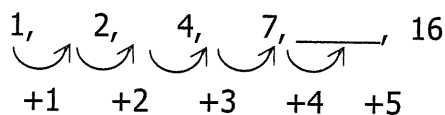
End of Paper

SASMO 2015 Primary 3 Solutions

Section A

Question 1

The pattern is as follows:



\therefore the missing term is $7 + 4 = \mathbf{11}$.

Question 2

$$3^4 = 3 \times 3 \times 3 \times 3 = 81$$

Question 3

$$a \star b = (a + b)(a - b)$$

$$\therefore 7 \star 5 = \mathbf{122}$$

Question 4

Area of 7 identical squares = 112 cm^2

Area of one square = 16 cm^2

Length of square = 4 cm

Since the perimeter of the figure is made up of 16 sides of a square, then its perimeter

$$= 16 \times \text{length of square}$$

$$= 16 \times 4$$

$$= \mathbf{64 \text{ cm}}$$

Question 5

4 tens 5 ones greater than 2 tens 7 ones is $45 + 27 = 72$.

\therefore the missing number is **72**

Question 6

Statement A: $7 + (0 \times 2) = 7 + 0 = 7$

Statement B: $7 + (0 \div 2) = 7 + 0 = 7$

Statement C: $7 + (2 \times 0) = 7 + 0 = 7$

\therefore **all the three statements are correct.**

Question 7

Method 1 (Systematic Listing)

Chocolate	✓	✓	✓			
Cheese	✓			✓	✓	
Blueberry		✓		✓		✓
Blackforest			✓		✓	✓

∴ total no. of choices = **6**

Method 2 (Rephrase the Problem)

Choosing 2 types of cakes from 4 types is the same as the handshake problem of 4 people shaking hands once with one another.

∴ total no. of choices = $3 + 2 + 1 = \mathbf{6}$

Question 8

No. of 1×1 squares = 9

No. of 2×2 squares = 4

No. of 3×3 squares = 1

∴ total no. of squares in a 3×3 square grid = $9 + 4 + 1 = \mathbf{14}$

Question 9

Method 1

Numbers between 14 and 40 that are divisible by 4 are: 16, 20, 24, 28, 32 and 36.

Of these 6 numbers, only 24 and 36 are divisible by 3.

∴ the smallest whole number between 14 and 40 that is divisible by 3 and by 4 is **24**.

Note: A number that is between 14 and 40 does not include 14 and 40. If we start with numbers divisible by 3, there will be more possibilities.

Method 2

A number that is exactly divisible by both 3 and 4 must also be exactly divisible by 12.

The only numbers between 14 and 40 that are exactly divisible by 12 are 24 and 36.

∴ the smallest whole number between 14 and 40 that is divisible by 3 and by 4 is **24**.

Question 10

Since $7 \times 7 = 49$ and $8 \times 8 = 64$, then the length of the largest square that can be made from 50 one-centimetre square tiles is **7 cm**.

Section B

Question 11

Least possible value of the sum of the two numbers

= least possible value of first number + least possible value of second number

= $5 + 2$

= **7**

Question 12

Using the divisibility test for 3, $1 + 2 + N + 4 = N + 7$ is also divisible by 3.

Since N is a single digit, $N = 2, 5$ and 8 .

But N is less than 5 (given).

$\therefore N = 2$

Question 13

Since $28 = 2 \times 2 \times 7 = (2 \times 7) \times 2$, then the smallest number that can be multiplied by 28 to give a perfect square is **7**, so that $(2 \times 7) \times (2 \times 7) = 14 \times 14$ is a perfect square.

Question 14

By counting, 7 days from a Monday is Monday.

So 49 days ($= 7 \times 7$ day) from a Monday is still Monday.

\therefore 50 days from a Monday is **Tuesday**.

Question 15

$32 \text{ cm} \div 4 \text{ cm} = 8$ cards along the length of the rectangular sheet.

$21 \text{ cm} \div 3 \text{ cm} = 7$ cards along the breadth of the rectangular sheet.

\therefore biggest number of cards that can be cut from the sheet $= 8 \times 7 = \mathbf{56}$

Question 16

The sharpener is the first item on the left.

 S , , , ,

The eraser is next to the hole puncher and the sharpener.

This means that the eraser is the second item next to the sharpener, and the hole puncher is the third item.

 S , E , H , ,

The ruler is next to the hole puncher.

 S , E , H , R ,

Thus the last item is the pen.

∴ the order of the items on the table from first to last is **sharpener, eraser, hole puncher, ruler and pencil.**

Question 17

In the ones column, $N - N = 0$, so **O = 0**.

In the hundreds column, if $N \geq 2$, the final answer for the subtraction will be a 3-digit number, so **N = 1**.

Now $\overline{NO} - A = N$ implies that $10 - A = 1$, so **A = 9**.

∴ **NO = 101 - 91 = 10.**

Question 18

Since the question states that 'less than 10 boxes are used', it suggests that there should be more big boxes than small boxes. So we use guess and check starting with fewer small boxes:

No. of Small Boxes	No. of Cakes Left	No. of Big Boxes	Total No. of Boxes
1	$50 - 4 = 46$	$46 \div 6$ has left over	–
2	$50 - 8 = 42$	$42 \div 6 = 7$	9
3	$50 - 12 = 38$	$38 \div 6$ has left over	–
4	$50 - 16 = 34$	$34 \div 6$ has left over	–
5	$50 - 20 = 30$	$30 \div 6 = 5$	10

Note: Actually you can stop after getting a total of 9 boxes because if you use more small boxes, the total no. of boxes will be bigger than 9.

\therefore no. of big boxes used = **7**

Question 19

Method 1 (Guess and Check)

Since Alice is a girl and she has as many sisters as she has brothers, then the number of girls in the family is one more than the number of boys.

	Ben has twice as many sisters as he has brothers. True or false?
2 girls and 1 boy	Ben has 2 sisters and 0 brother. Above statement is <i>false</i> .
3 girls and 2 boys	Ben has 3 sisters and 1 brother. Above statement is <i>false</i> .
4 girls and 3 boys	Ben has 4 sisters and 2 brothers. Above statement is <i>true</i> .

Using guess and check as shown in the above table, there are **3 boys** and **4 girls** in the family.

Method 2 (Model Method)

For Alice

Boys	<input type="text"/>
Girls	<input type="text"/> 1
<i>For Ben</i>	
Boys	<input type="text"/> 1
Girls	<input type="text"/>

From the model for Ben, 1 unit for Girls = $1 + 1 = 2$.

∴ there are **3 boys** and **4 girls** in the family.

Question 20

Put the two shaded rectangles to form a long rectangle as shown:



Length of long rectangle = $\frac{1}{2} \times$ perimeter of unshaded rectangle

$$= \frac{1}{2} \times 16 \text{ cm}$$

$$= 8 \text{ cm}$$

Breadth of long rectangle = length of square = 3 cm

∴ total area of shaded rectangles = $8 \text{ cm} \times 3 \text{ cm} = \mathbf{24 \text{ cm}^2}$

SASMO 2016 Primary 3 (Grade 3) Contest

Question 1

$$3 \times 2016 + 0 \times 2016 + 3 \times 2016 = ?$$

- A. 0
- B. 2016
- C. 6048
- D. 12096
- E. None of the above

Question 2

Four sports cars travel 4 kilometres in 1 minute. How long does it take for one sports car to travel 4 kilometres?

- A. 1 minute
- B. 2 minutes
- C. 3 minutes
- D. 4 minutes
- E. 5 minutes

Question 3

If the day before yesterday was Sunday. How many days are there from today until Sunday?

(For example, Monday to Wednesday is counted as two days)

- A. 2
- B. 3
- C. 4
- D. 5
- E. 6

Question 4

How many minutes are there in 2 weeks?

- A. $2 \times 7 \times 24$
- B. $(7 + 7) \times 24 \times 60$
- C. $2 \times 7 \times 12 \times 60$
- D. $2 \times 24 \times 60$
- E. $(7 + 7) \times 12 \times 60$

Question 5

Points P, Q, R and S are on a line. The length of PQ, QR and RS are 12cm, 14cm and 18 cm, respectively. What is the shortest distance between P and S?

- A. 6
- B. 8
- C. 10
- D. 12
- E. 14

Question 6

A 12-metre long steel pipe was cut into few pieces. The length of each piece is 3 metres. It takes 18 minutes to complete the whole process. How long does it take to cut a 12-metre pipe into 6-metre sections?

- A. 6 minutes
- B. 9 minutes
- C. 12 minutes
- D. 18 minutes
- E. None of the above

Question 7

The sum of 5 consecutive numbers is 500. Among all five numbers, what is the smallest value?

- A. 95
- B. 96
- C. 97
- D. 98
- E. 99

Question 8

Find the next number in the following sequence

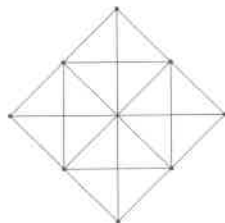
21, 24, 19, 26, 17, ?, ...

- A. 18
- B. 19
- C. 27
- D. 28
- E. None of the above

Question 9

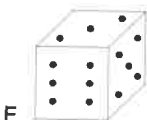
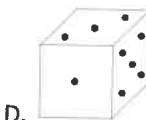
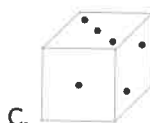
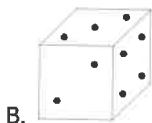
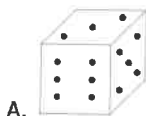
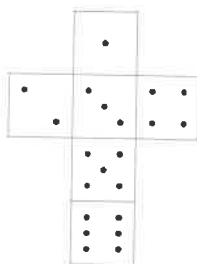
How many squares are there in the diagram below?

- A. 8
- B. 9
- C. 10
- D. 11
- E. 12



Question 10

Which of the following dice can be formed by folding the figure on the right?



Question 11

If the four-digit number $28X8$ is divisible by 3, how many possible values are there for X ?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

Question 12

How many multiples of 7 are between 20 and 100?

- A. 10
- B. 11
- C. 12
- D. 13
- E. 14

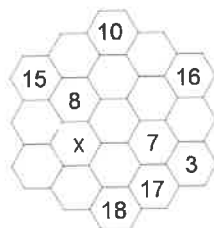
Question 13

Suppose it is now the month of December. What month will it be 100 calendar months from now?

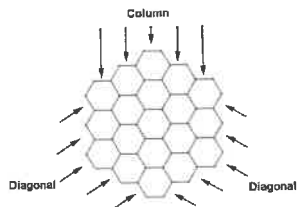
- A. January
- B. February
- C. March
- D. April
- E. May

Question 14

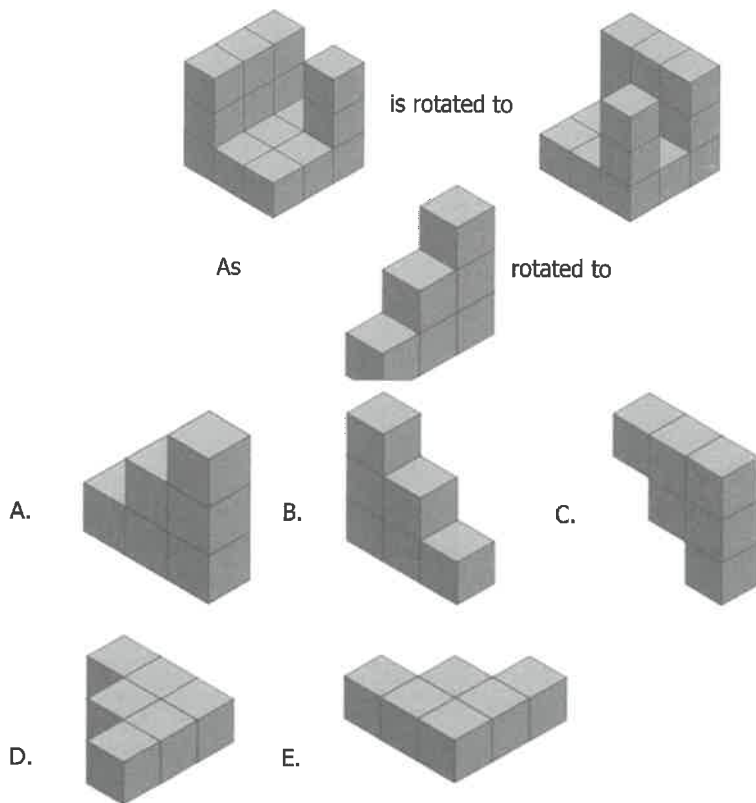
In the figure on the right, numbers from 1 to 19 are to be filled in each hexagon. The sum of the numbers in each diagonal and column is 38. What is the value of 'X'?



- A. 2
- B. 6
- C. 11
- D. 14
- E. 19



Question 15



Question 16

Cindy left her home to buy some groceries at 10.15 am. She took her lunch before going back home. She reached home at 3.30 pm. How many minutes was she out of her house?

Question 17

What is the answer to the following?

$$2 - 3 + 4 - 5 + 6 - 7 + 8 - 9 + 10 - \dots + 2014 - 2015 + 2016 = ?$$

Question 18

In a magic show, the magician placed 3 cards on the table, as shown below. Each card has a **math symbol** on one side and a **number** on other side.



After showing the cards, he flipped over some (maybe all) of the cards and rearranged them. The new arrangement of the cards is shown below.






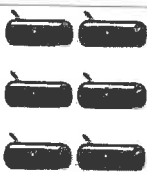
What number is on other side of the card with the symbol ' \times '?

Question 19

There are 18 books on the first shelf. There are 24 books on the second shelf. How many books must be moved from the first shelf to the second shelf such that the second shelf has twice as many books as the first shelf?

Question 20

The table below shows the number of pencil cases that Bob, Macy, Jane and Danny each have. Each pencil case has the same number of pencils. Danny has 27 more pencils than Bob. How many pencils do they have altogether?

			
Bob	Macy	Jane	Danny

Question 21

Lily, Macy and Ronald are old classmates. During a recent gathering, they told each other about their occupation. Among them, there is a teacher, a doctor and a lawyer.

Below are the hints about their occupations:

Ronald is older than the teacher.

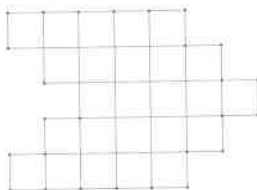
Macy is younger than the lawyer.

The lawyer is younger than Lily.

What is Lily's occupation?

Question 22

The figure below is made up by small squares with length of 3. What is the perimeter of the figure below?



,

Question 23

Find an odd number between 200 and 241 which can be divided by both 3 and 7.

Question 24

Tom wrote the numbers from 1 to 129 on the whiteboard. How many digits did he write?

Question 25

In the following, all the different letters stand for different digits. Find the 4-digit number CDDB.

$$\begin{array}{r} A B C \\ + A B C \\ \hline C D D B \\ \hline \end{array}$$

End of Paper

SASMO 2017 Primary 3 (Grade 3) Contest

Question 1

What is the sum of the following numbers?

$$2017 + 7012 + 271 =$$

- A. 9200
- B. 9290
- C. 9300
- D. 9390
- E. None of the above

Question 2

Fill in the blank: _____ is 3 tens 7 ones less than 4 tens 6 ones.

- A. 9
- B. 19
- C. 73
- D. 83
- E. None of the above

Question 3

Sally wrote the following

Singapore and Asian Schools Math Olympiad

She started on Sunday and wrote one letter each day. Which day of the week will she finish writing all the letters?

- A. Saturday
- B. Sunday
- C. Monday
- D. Tuesday
- E. None of the above

Question 4

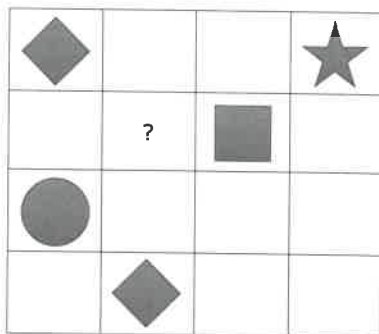
What is the next number in the sequence below?

47, 44, 38, 29, 17, ...

- A. 12
- B. 8
- C. 5
- D. 2
- E. None of the above

Question 5

The following grid can be filled with exactly 4 shapes (star, square, circle and diamond) such that there is no duplicated shape in each row or column. What shape should be put in the place of the question mark?



- A. 
- B. 
- C. 
- D. 

E. It cannot be found

Question 6

During day time, Jack is standing in front of a mirror. What will be the time after 15 minutes?

- A. 10:10 am
- B. 10:25 am
- C. 2:05 pm
- D. 3:05 pm
- E. None of the above



Question 7

Hannah bought 5 whole pizzas: 1 for herself and 1 for each of her 4 students.

Hannah sliced her pizza into 5 equal parts and ate only 3 slices.

Student A sliced his pizza into 4 equal parts, but ate only 3 slices.

Student B sliced his pizza into 8 equal parts, but ate only 7 slices.

Student C sliced her pizza into 3 equal parts, but ate only 2 slices.

Student D sliced her pizza into 6 equal parts, but ate only 3 slices.

Who ate less pizza than Hannah?

- A. Student A
- B. Student B
- C. Student C
- D. Student D
- E. Nobody

Question 8

Some animals are placed on both sides of the balance scale. If the two sides weigh the same, the balance scale will stay balanced.

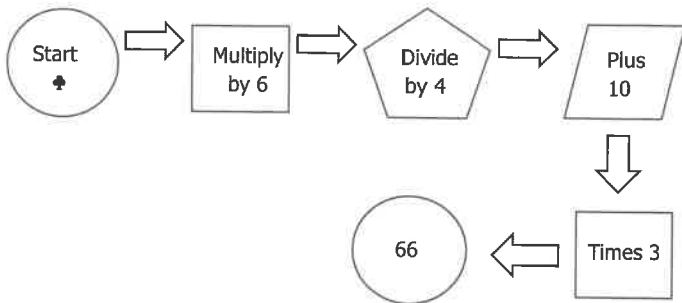
How many birds will have the same weight as ONE elephant?



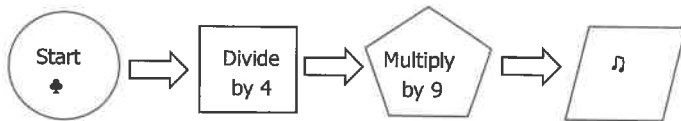
- A. 3
- B. 4
- C. 5
- D. 6
- E. None of the above

Question 9

Suppose ♣ represents a whole number. The number 66 is obtained by performing the following operations below.



Starting with ♣ again, perform the operations below.



What is the whole number that ♪ represents?

- A. 8
- B. 18
- C. 36
- D. 108
- E. None of the above

Question 10

Nick wants to bake a cake that consists of only 1 flavour and 1 topping. He gets to choose from 3 different flavours and 3 different toppings. How many different kinds of cake can he make?

- A. 3
- B. 6
- C. 9
- D. 12
- E. None of the above

Question 11

Find the picture below which is exactly the same as the picture on the right.



A.



B.



C.



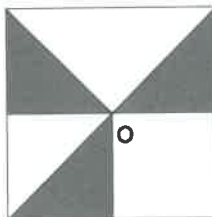
D.



E.

Question 12

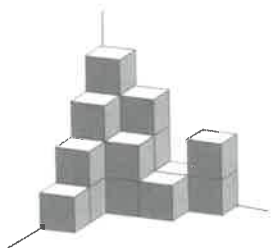
The square below has an area of 40 cm^2 . Point O is the centre of the square. What is the area of the shaded region?



- A. 10 cm^2
- B. 15 cm^2
- C. 20 cm^2
- D. 24 cm^2
- E. None of the above

Question 13

The diagram shows some cubes of the same size stacked at a corner of a room. How many cubes are there altogether? (Note: The floor is horizontal and the two walls are vertical. There are no gaps or holes behind the visible cubes.)



- A. 13
- B. 15
- C. 17
- D. 19
- E. None of the above

Question 14

An unknown number is an odd number greater than 50 but less than 100. The number is a multiple of 3 and 7. What is the value of the unknown number?

- A. 63
- B. 77
- C. 84
- D. 91
- E. None of the above

Question 15

The operator Δ acts on two numbers to give the following outcomes:

- $3 \Delta 2 = 12$
- $4 \Delta 5 = 40$
- $5 \Delta 9 = 90$
- $6 \Delta 1 = 12$

What is $2 \Delta 7$ equal to?

- A. 14
- B. 20
- C. 24
- D. 28
- E. None of the above

Question 16

Given that

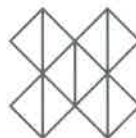
$$\text{banana} + \text{apple} + \text{banana} + \text{apple} + \text{banana} = 20 \quad \text{and}$$

$$\text{apple} + \text{banana} + \text{apple} = 16,$$

what is the value of $\text{apple} + \text{banana}$?





Question 17

How many triangles are there in the figure on the right?



Question 18

The picture graph below shows the number of story books that Phoebe, Queenie, Rachael and Suzy have. Each bag represents the same amount of books. Altogether, they have 40 books.

Phoebe	
Queenie	
Rachael	
Suzy	

If Queenie wishes to have twice as many books as Phoebe, how many books does Queenie need to buy?

Question 19

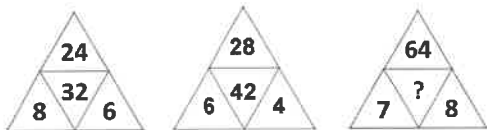
Jason, Adam and Tom are siblings. They are 6, 9 and 10 years old. Tom's age is a multiple of 3. Jason is younger than Tom. How old is Adam?

Question 20

In 6 years, Claire will be three times her current age. What will be Claire's age two years from now?

Question 21

Observe a pattern and find the value of '?'.

Question 22

The teacher asks Lisa to write all the odd numbers between 0 and 100. How many of the numbers consist of the digit '1'?

Question 23

Tony bought 25 candies from a grocery shop. He bought 7 more apple candies than orange candies. He bought 3 more apple candies than grape candies. He bought 2 more pineapple candies than orange candies. How many apple candies did Tony buy?

Question 24

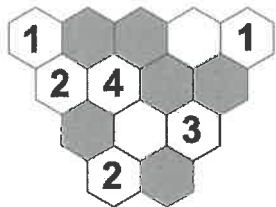
In the following, all the different letters stand for different digits. What is the value of the 2-digit number QP?

$$\begin{array}{r} P Q \\ + Q P \\ \hline Q P \end{array}$$

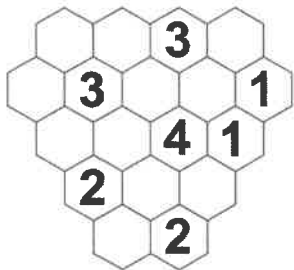
Question 25

As shown in Example 1, each number in a cell represents the number of shaded cells that surround it.

Example 1:



How many shaded cells will be in the grid below after you shade it according to the rules above?



END OF PAPER

SASMO 2018 Primary 3 (Grade 3) Contest

Question 1

What is the total number of hearts below?



- A. 51
- B. 52
- C. 53
- D. 54
- E. None of the above

Question 2

Which of the following is the same as 2018 cm?

- A. 2 metres and 18 centimetres
- B. 2 kilometres and 18 centimetres
- C. 20 metres and 18 centimetres
- D. 201 metres and 8 centimetres
- E. None of the above

Question 3

The following table shows the scores of Tiffany, Ursula, Vincent and Warren in the "Mathcraft Game".

	Round 1	Round 2	Round 3	Round 4
Tiffany	7	56	8	43
Ursula	37	24	36	13
Vincent	27	41	23	21
Warren	27	38	23	27

Who received the highest score?

- A. Tiffany
- B. Ursula
- C. Vincent
- D. Warren
- E. Tiffany and Vincent

Question 4

Ducklings are walking in a queue when they are following the mother duck. Joey the duckling is the 6th from the front and 8th from the back (including the mother duck). Some of the ducklings at the back moved away from the queue making Joey the middle duckling in the queue. How many ducklings moved away from the queue?

- A. 2
- B. 3
- C. 4
- D. 5
- E. None of the above.

Question 5

George takes 4 minutes to go from 1st floor to 3rd floor. He just realized that he forgot his water bottle on the 5th floor. He is now on the 2nd floor. How long would it take him to get his water bottle?

- A. 4 minutes
- B. 5 minutes
- C. 6 minutes
- D. 8 minutes
- E. None of the above.

Question 6

What is the next number below?

3, 5, 6, 10, 9, 15, 12, 20, _____

- A. 13
- B. 15
- C. 18
- D. 25
- E. None of the above

Question 7

Hansel wants to buy 2 dice of different colours. If the available colours in a store are red, blue, green, yellow, pink and white, how many different combinations of 2 dice are there in the store? (Example: 1 combination is yellow and white)

- A. 5
- B. 10
- C. 15
- D. 20
- E. None of the above

Question 8

A palindrome is a number that can be read the same forward and backward. For example, the numbers 99, 252 and 4884 are palindromes. How many 3-digit palindrome numbers are there?

- A. 81
- B. 900
- C. 90
- D. 9
- E. None of the above

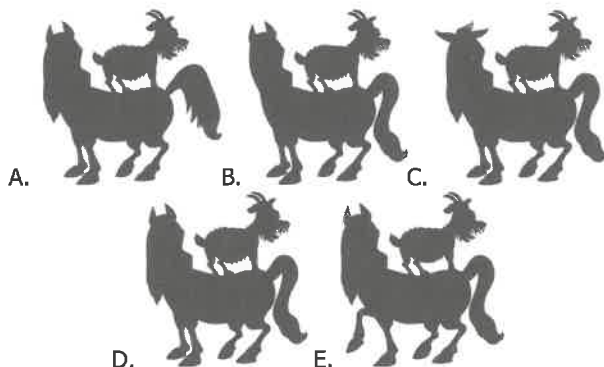
Question 9

Which of the following CANNOT form a rectangle?

- A. Two identical triangles
- B. Two identical squares
- C. Five identical squares
- D. Four identical triangles
- E. Five identical triangles

Question 10

Find the correct shadow of the animals shown on the right.



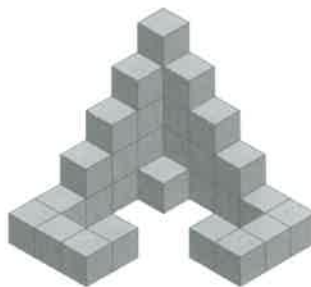
Question 11

Elmo visits the Sesame Street Park every Wednesday. If the 1st of January 2017 was Sunday and February had 28 days, what was the last date in March 2017 in which Elmo visited Sesame Street Park?

- A. 28th March
- B. 29th March
- C. 30th March
- D. 31st March
- E. None of the above

Question 12

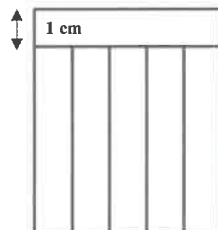
The diagram shows some cubes of the same size stacked at a corner of a room. How many cubes are there altogether? (Note: The floor is horizontal and the two walls are vertical. There are no gaps or holes behind the visible cubes.)



- A. 23
- B. 26
- C. 28
- D. 30
- E. None of the above

Question 13






The figure is made up of 6 identical rectangles with breadth of 1 cm. What is the perimeter of the figure?

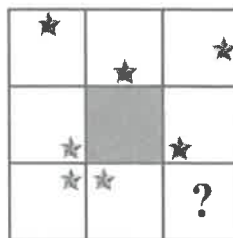


- A. 20
- B. 22
- C. 24
- D. 26
- E. None of the above.

Question 14

What is the missing piece '?' in the diagram?

- A.  B.  C. 
- D.  E. 



Question 15

A toy store has 43 yoyos in the first box and 23 yoyos in the second box. After a week, an equal number of yoyos from each box were sold. The number of yoyos in the first box were then five times as many as the number of yoyos in the second box. How many yoyos were left?



- A. 6
 B. 18
 C. 24
 D. 32
 E. None of the above

Question 16

Find the sum: $11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 + 27 + 29 + 31$

Question 17

How many rectangles are there in the picture below?



Question 18

In a classroom, Kevin wrote 30 more letters than Sara, and James wrote 40 more letters than Sara. Altogether, they wrote 160 letters. Find the number of letters Kevin wrote.

Question 19

Find a two-digit multiple of 6 which is one more than a multiple of 13.

Question 20

Andy shows a number to Zach, then they have the following conversation:

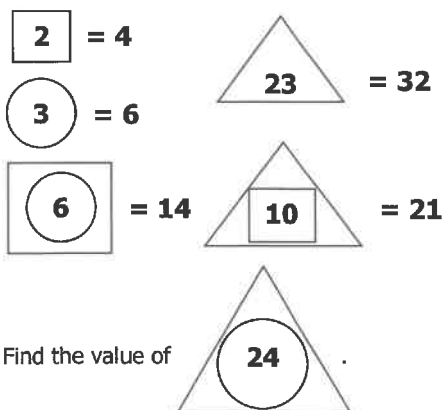
Andy: "Subtract 17 from it, then divide the result by 6. After that, add 39 to the new number and then multiply the resulting number by 4. Finally, add 29"

Zach: "Not hard, the final answer is 209 and I'm very sure it is the correct answer"

What is the number that Andy showed to Zach?

Question 21

Study the pattern below.



Question 22

Jeremy has the same size toy cars in his box in which 5 are red, 9 are blue and 4 are white. How many cars does he need to pick from the box without looking to be sure he will get 3 toy cars of the same colour?

Question 23

Given that

$$\text{Diamond} + \text{Hexagon} + \text{Diamond} = 15$$

$$\text{Diamond} + \text{Diamond} + \text{Hexagon} = 17$$

$$\text{Diamond} + \text{Hexagon} = 13$$

Find the value of



Question 24

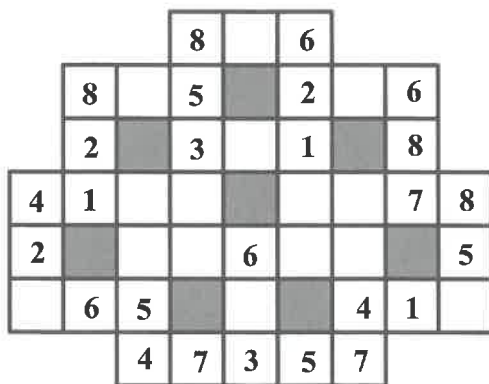
In the following, all the different letters stand for different digits.

$$\begin{array}{r} A \quad B \quad 2 \\ - \quad 3 \quad A \quad A \\ \hline 1 \quad A \quad 7 \end{array}$$

Find the value of $A + B + B + A$.

Question 25

Fill the figure with numbers so that each shaded square in the figure is surrounded by all digits from 1 to 8. How many times will the digit '8' appear in the filled figure?



END OF PAPER



Singapore & Asian Schools
Math Olympiad

Singapore and Asian Schools Math Olympiad

Primary 3

(Grade 3)

GEP Practice

*2 YEAR
SERIES*

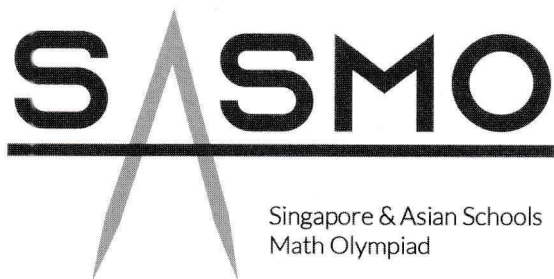
**2019-
2020**

*Contest Problems
with Full
Solutions*

**Henry Ong
Merlan Nagidulin**

Handbook for Math Competitions





Primary 3 (Grade 3) – GEP Practice

2019 & 2020 Contest Problems with Full Solutions

Authors:

**Henry Ong, BSc, MBA, CMA
Merlan Nagidulin, BSc**

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About the Authors:

Henry Ong is the Founder of SASMO and President of Singapore International Mastery Contest Centre (SIMCC). He conducts Math Olympiad classes, not only in Singapore but also around the 20 countries that have joined SASMO. He now travels round the world giving out awards and scholarships to students and teachers. He is now promoting new contests, Scholastic Trust Singapore Teachers' Institute (STSTI) and International Junior Honor Society (IJHS).

In February 2020, Henry was appointed Co-Chair of the Council Administration of Cambodian Mathematical Society (CA_CMS). Henry will share and use his great wealth of experience, expertise, and international networks to contribute effectively to: (1) promoting STEM: Science, Technology, Engineering, and Mathematics; (2) organizing and undertaking multilateral partnership programs; and (3) strengthening and improving the public-private partnership for development of STEM, research and development, and research and innovation as well as teacher professional development in Cambodia with relevant stakeholders in close collaboration and consultation with relevant leadership and management of Ministry of Education, Youth and Sport, especially Cambodian Mathematical Society (CMS), New Generation Pedagogical Research Center (NGPRC), National Institute of Education (NIE) and Teacher Training Department (TTD).

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Scholastic Trust Singapore President's Message

Dear SIMCC contestants, parents, teachers, and partners,

I hope all of you are safe and healthy. We have all gone through so much within the past year, and we should rejoice - we are all **alive and well**. Despite all the gloom and predictions of the worst recession to hit us very soon, we at SIMCC, are expanding globally – adding another 14 country partners to a total of 35 countries and territories within the last 10 months, and setting up sales offices in Cambodia and India, in addition to taking over the ICAS competitions and staff from the University of New South Wales Global Office based in Hong Kong and Macau.

Two years, Sophie Koh, our Senior Director of IT, Events and Operations left Singapore Polytechnic as a Senior Lecturer of IT to join us. She has almost digitally transformed most of our operations and contest systems. This will provide valuable big data in formative and summative assessments for teachers to measure their students and inform their teaching. Parents and students will also receive Detailed Performance Reports (DPR) in our Member Development Portal (MDP) to improve their Academic Skills. Teachers and their schools will be able to download Students' Analytical Performance Reports (SAPR). SIMCC together with our partners will be conducting more Webinars to prepare teachers and parents to use our contests and data to arm their wards with Skills and Recognition for SUCCESS.

From February 16 to April 30, 2021, we are offering the 1st Singapore Math Global Assessments (SINGA) for grades 1 to 11 students. We want to open this up to every country, especially since Singapore Math textbooks are used in schools from over 70 countries. We want to share our rich Singapore Math heritage that has propelled Singapore students to the top of PISA rankings since the 1990s. We also have excellent teachers, Learning Management System (LMS), Math textbooks, assessment books, as well as teacher training to help improve math education worldwide. Reach out to us for help, if you want your students to become Mathematics Heroes!

The global winners of SINGA Math Assessments are invited for the 1st SINGA Math Global Finals, in their home countries on September 11, 2021. The prize for the Overall Champion of grades 1 to 10/11 is a S\$600 competition package to compete in the STEAM AHEAD International Junior Mathematics Olympiad (IJMO) to be held in Bali, Indonesia from December 3 to 7, 2021. The prize for Overall Runner-up is S\$250 and 2nd Runner-up is S\$150, offering a total prize award of S\$10,000. Winners of Gold (10%) and Silver (15%) are invited to compete in STEAM AHEAD IJMO 2021.

From 2021, we will be offering most of our contests to grade 12 students – SASMO, DrCT, SIMOC, and STEAM AHEAD. This will pave the way for Grades 12 SIMCC students to apply for SIMCC and STS's US\$270,000 endowed 2 scholarships for 4-year undergraduate studies at Southern Illinois University (SIU), Carbondale, Illinois, USA in STEM related fields. SIU has also given SIMCC over 30 SIU International Student Tuition Grants to award to top SIMCC students to pursue their university education. SIMCC will setup our own network for SIMCC scholars at SIU. This will help us expand SIMCC contests in North America and generate revenue for us to fund more scholarships.

Best Regards,
Henry Ong, President

3. Create a Simpler Problem

Sometimes we are not able to solve the problem as it is stated, but we are able to solve a similar problem that is similar in some way. For example, the simpler problem may use simpler numbers. Once we solve one or more simpler problems, we may understand the approach that can be used to solve the problems of similar type and may be able to solve the problem that has been given to us.

4. Use Logical Reasoning

Logical reasoning is useful in mathematics problems in various ways. It can be used to eliminate incorrect choices. It can also sometimes be used to conclude the answer directly.

5. Guess and Check

"Guess and Check" strategy can be used on many problems. If the number of possible answers is small, one can use this strategy to come up with the answer very quickly. In some other cases where the number of possible answers is not small, one may still be able to make intelligent guesses and come up with the answer.

6. Working Backwards

Sometimes, it is easier to start with information at the end of the problem and work backwards to the beginning of the problem than the other way around.

SASMO 2019 Primary 3 (Grade 3) Contest Questions

Section A (Correct answer – 2 points | No answer – 0 points | Incorrect answer – minus 1 point)

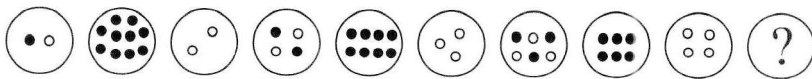
Question 1

Calculate the value of $7 + 16 + 34 + 45 + 50 - 6 - 15 - 4 - 7$.

- A. 70
- B. 120
- C. 127
- D. 124
- E. None of the above

Question 2

Study the pattern below.



How many black circles are in the circle with the question mark?

- A. 0
- B. 2
- C. 3
- D. 4
- E. None of the above



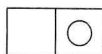
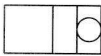

Question 3

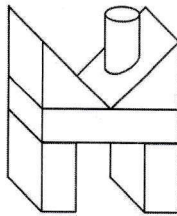
Kevin has 3 regular dice. Each dice has numbers from 1 to 6. Which of the following could not be the sum of the numbers on top of the 3 dice?

- A. 5
- B. 13
- C. 17
- D. 22
- E. All the above numbers are possible sum

Question 4

Find the top view of the figure on the right.

- A.  B.  C. 
- D.  E. 

**Question 5**

Mitchell, Jason, Tom and Mark race across a field. Mark finishes one place ahead of Jason. Mitchell finishes one place behind the winner. Who is the winner of the race?

- A. Mitchell
- B. Jason
- C. Tom
- D. Mark
- E. Jason and Mark

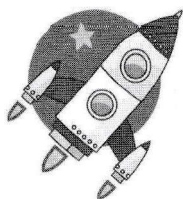
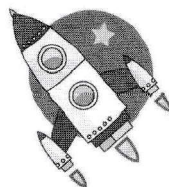
Question 6

In a toy store, cars are available in 5 different colours: blue, white, yellow, black and red. A car has either 2 or 4 doors. How many different versions of the car are available?

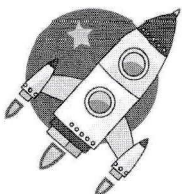
- A. 10
- B. 20
- C. 8
- D. 9
- E. None of the above

Question 7

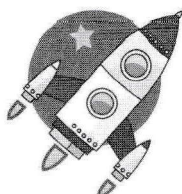
Find the mirror image of the picture on the right.



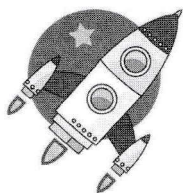
A



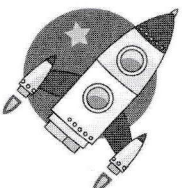
B



C



D



E

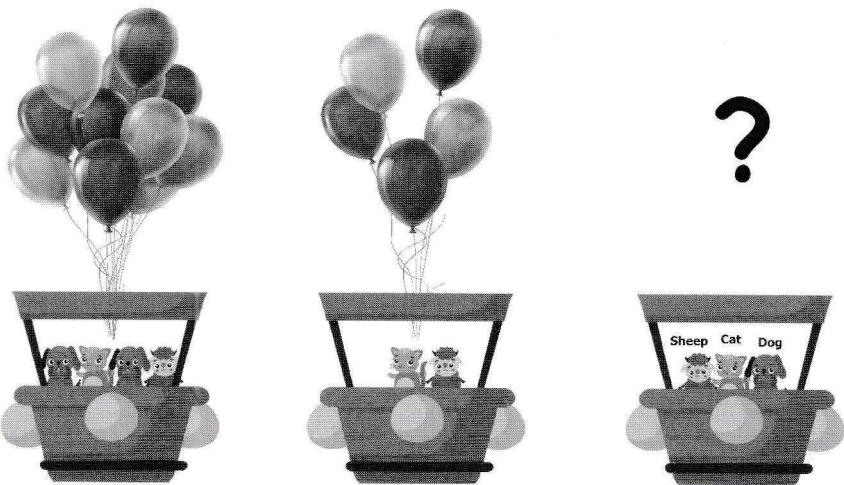
Question 8

The four-digit number 32B9 is divisible by 3. If B is even, find the digit B.

- A. 0
- B. 2
- C. 4
- D. 6
- E. 8

Question 9

Study the picture below.



How many balloons are needed to carry the sheep, cat and dog?

(All balloons are visible in the picture and the same size. None of the balloons are hidden.)

- A. 8
- B. 16
- C. 7
- D. 9
- E. None of the above

Question 10

A group of friends arrive at SASMO Cinema at 9:30. They watch any movie together. What is the earliest time they could finish watching both movies?

<i>SASMO Cinema</i>		
Title	Duration	Show Times
Four Princesses	115 minutes	10:00, 12:15, 13:55, 17:05, 19:35
Dragon Fighter	105 minutes	9:00, 10:55, 14:10, 16:50, 19:35

- A. 14:00
- B. 12:40
- C. 15:50
- D. 15:55
- E. None of the above

Solution:

Case 1: They watched Four Princesses first.

The earliest time they can watch Four Princesses is 10:00. They finish at 11:55 and continue with Dragon Fighter at 14:10. The earliest time they could finish watching both movies is 15:55.

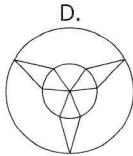
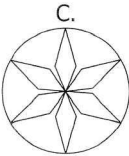
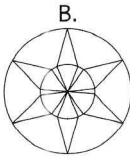
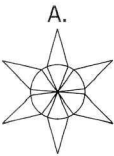
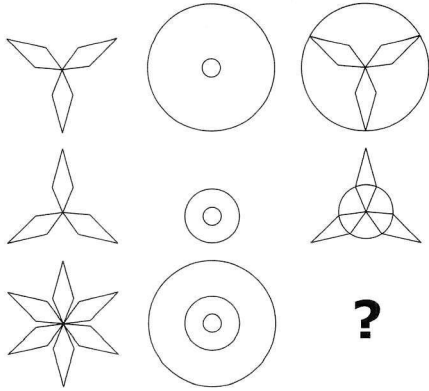
Case 2: They watched Dragon Fighter first.

The earliest time they can watch is 10:55 since they missed the first session at 9:00. They finish at 12:40 and continue with Four Princesses at 13:55. The earliest time they could finish watching both movies is **15:50** which is earlier than 15:55.

Answer: (C)

Question 11

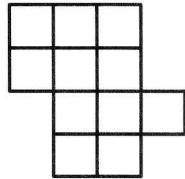
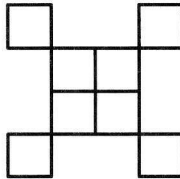
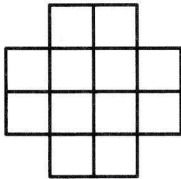
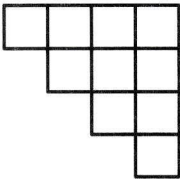
Find the missing shape in the diagram below.



E.
None of them

Question 12

All the figures below are made up of identical squares. The area of the figure with the largest area is 48 cm^2 . What is the perimeter of the figure with the largest perimeter?



- A. 46 cm
- B. 96 cm
- C. 32 cm
- D. 48 cm
- E. None of the above

Question 13

On Saturday, Diana read 102 pages of a book. On Sunday, she read 100 pages of the same book. Every day, she read 2 pages less than the day before. On which day of the week did she read exactly 4 pages of the book?

- A. Monday
- B. Wednesday
- C. Friday
- D. Sunday
- E. None of the above

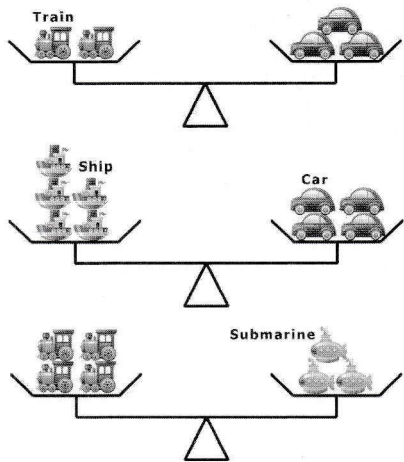
Question 14

How many two-digit numbers can be divided by both 2 and 3 at the same time?

- A. 16
- B. 75
- C. 15
- D. 60
- E. None of the above

Question 15

Study the picture below.



Which toy is the heaviest?

- A. Train
- B. Submarine
- C. Ship
- D. Car
- E. None of the above

Section B (Correct answer – 4 points | Incorrect or No answer – 0 points)

When an answer is a 1-digit number, shade "0" for the tens, hundreds and thousands place.

Example: if the answer is 7, then shade 0007

When an answer is a 2-digit number, shade "0" for the hundreds and thousands place.

Example: if the answer is 23, then shade 0023

When an answer is a 3-digit number, shade "0" for the thousands place.

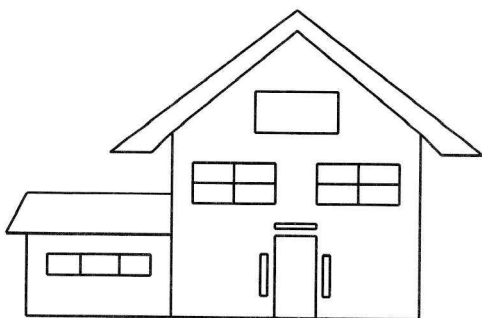
Example: if the answer is 785, then shade 0785

When an answer is a 4-digit number, shade as it is.

Example: if the answer is 4196, then shade 4196

Question 16

How many rectangles are there in the picture below?

**Question 17**

The operator \oplus acts on two numbers to give the following outcomes:

$$2 \oplus 4 = 44$$

$$5 \oplus 7 = 104$$

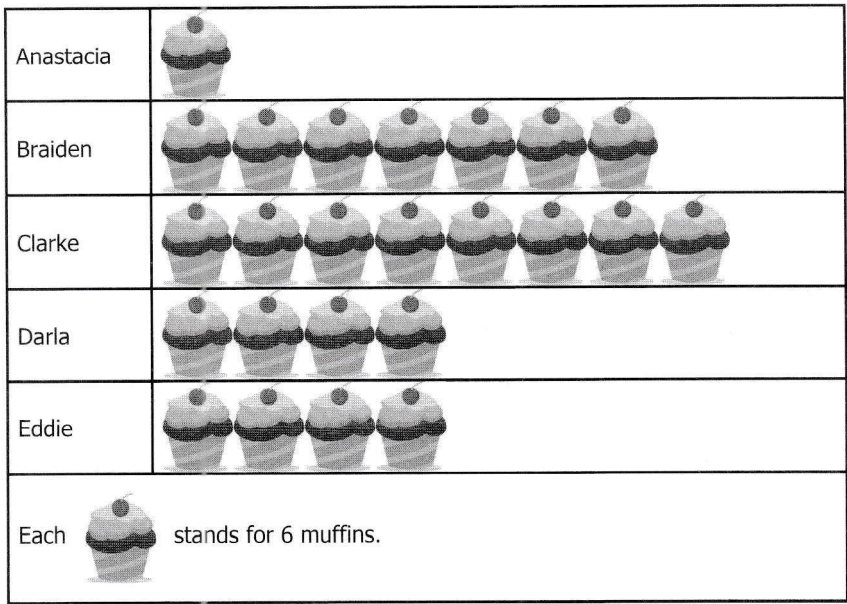
$$1 \oplus 5 = 28$$

$$7 \oplus 10 = 146$$

What is $6 \oplus 12$ equal to?

Question 18

The picture graph below shows the number of muffins 5 siblings have at first.



Their mom takes all their muffins and then distributes equally among Anastacia, Braiden, Darla and Eddie. How many more muffins does Eddie have now than before?

Question 19

Andrew, Kim and Shaun have 256 stamps. Shaun has twice as many stamps as Kim. Andrew has 24 less stamps than Shaun. How many stamps does Andrew have?

Question 20

In the number sentence below, what is the value of \square ?

$$\square \times 6 + 13 - \square = 17 + 46$$

Question 21

Use the clues below to find the number being described.

- This number is a 3-digit number.
- The sum of its digits is 15.
- The digit in the tens place is twice the digit in the hundreds place.
- The digit in the hundreds place is 1 more than the digit in the ones place.

Question 22

A group of children and adults went to a zoo. The price of an adult's ticket is \$8 and a child's ticket is \$7. The group paid \$90 for their tickets. Given that there were less than 14 people in the group, how many adults were there?

Question 23

A book has 130 pages numbered from 1 to 130. How many digit "1" are there in all the page numbers of the book?

Question 24

Picture 2 shows the completed version of the puzzle in Picture 1.

$$\begin{array}{ccc}
 \boxed{} & \times & \boxed{2} = \boxed{} \\
 \times & & \times & + \\
 \boxed{6} & \times & \boxed{2} = \boxed{} \\
 = & & = & = \\
 \boxed{24} & - & \boxed{} = \boxed{}
 \end{array}$$

Picture 1

$$\begin{array}{ccc}
 \boxed{4} & \times & \boxed{2} = \boxed{8} \\
 \times & & \times & + \\
 \boxed{6} & \times & \boxed{2} = \boxed{12} \\
 = & & = & = \\
 \boxed{24} & - & \boxed{4} = \boxed{20}
 \end{array}$$

Picture 2

Complete the puzzle in Picture 3 and find the missing number "?".

$$\begin{array}{ccc}
 \boxed{} & \times & \boxed{2} = \boxed{} \\
 \times & & \times & + \\
 \boxed{7} & \times & \boxed{} = \boxed{} \\
 = & & = & = \\
 \boxed{} & - & \boxed{?} = \boxed{53}
 \end{array}$$

Picture 3

Question 25

In the following, all the different letters stand for different digits. What is the value of $A + B + C$?

$$\begin{array}{r} A \quad B \quad B \quad B \\ - \quad \quad C \quad C \quad C \\ \hline \quad \quad \quad A \\ \hline \end{array}$$

END OF PAPER

SASMO 2020 Primary 3 (Grade 3) Contest Questions

Section A (Correct answer – 2 points | No answer – 0 points | Incorrect answer – minus 1 point)

Question 1

What is the value of the following sum?

$$902 + 804 + 700 + 609 + 508 + 403 + 307 + 201 + 106$$

- A. 4450
- B. 4540
- C. 4500
- D. 4505
- E. None of the above

Question 2

Fill in the blank: _____ is 2 tens 8 ones less than 5 tens 5 ones.

- A. 27
- B. 37
- C. 73
- D. 20
- E. None of the above

Question 3

Study the pattern below and find '?'.

		?



Question 4

Alice's first day in Caterpillar Club was Tuesday. She wants to throw a party on her 40th day in the club. If Alice attends the club every day, on which day of the week will the party be?

- A. Friday
- B. Saturday
- C. Sunday
- D. Monday
- E. None of the above

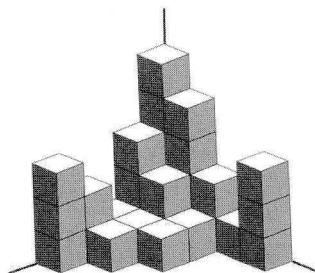
Question 5

How many multiples of 6 are there between 14 and 100?

- A. 16
- B. 15
- C. 14
- D. 13
- E. None of the above

Question 6

The diagram shows some cubes of the same size stacked at a corner of a room. How many cubes are there altogether? (Note: The floor is horizontal, and the two walls are vertical. There are no gaps or holes behind the visible cubes.)



- A. 20
- B. 30
- C. 31
- D. 29
- E. None of the above

Question 7

Alicia and Emily agreed to meet at the cinema at 3.55 pm. Emily left her house at 1.47 pm but arrived at the cinema 17 minutes late. How long was Emily's journey from her house to the cinema?

- A. 189 minutes
- B. 172 minutes
- C. 216 minutes
- D. 206 minutes
- E. None of the above

Question 8

What is the missing number in the sequence below?

1, 3, 7, 15, 31, ____

- A. 63
- B. 47
- C. 57
- D. 59
- E. None of the above

Question 9

If the four-digit number 3P78 is divisible by 3, how many possible values are there for P?

- A. 4
- B. 3
- C. 5
- D. 10
- E. None of the above

Question 10

In the fictional "Odd Island", all the numbers contain only odd digits. The order of the counting numbers is as follows

1, 3, 5, 7, ..., 19, 31, 33, ...

What is the 31st counting number in the island?

- A. 101
- B. 111
- C. 99
- D. 113
- E. None of the above

Question 11

The weights of four boys are 45 kg, 48 kg, 52 kg and 53 kg. Mason's weight is an even number. Joshua's weight is a multiple of 5. Christopher is not the heaviest and Mateo is not the lightest. Who is the heaviest among the four boys?

- A. Mason
- B. Joshua
- C. Christopher
- D. Mateo
- E. Impossible to determine

Question 12

Alex, John and Sam went to buy oranges. Alex paid \$20, John paid \$15, and Sam only paid \$5. They bought 120 oranges altogether. They divided them in proportion to the amount of money each of them had paid. How many oranges did John get?

- A. 15
- B. 30
- C. 45
- D. 60
- E. None of the above

Question 13

A tank filled with 200 litres of water weighs 350 kg. The same tank filled with 150 litres of water weighs 315 kg. What is the weight of the empty tank?

- A. 120 kg
- B. 150 kg
- C. 165 kg
- D. 210 kg
- E. None of the above

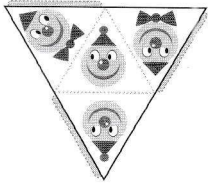
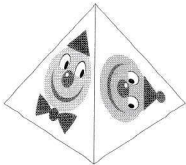
Question 14

A city council decided to put lanterns on both sides of a river. The distance between any two neighbouring lanterns on each side must be 11 metres. The length of the river is 132 metres. The distance between the first and the last lantern on each side must be also 132 metres. How many lanterns will there be in total?

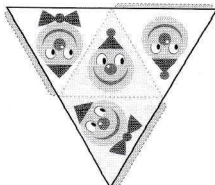
- A. 12
- B. 13
- C. 24
- D. 26
- E. None of the above

Question 15

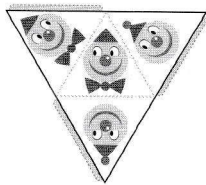
Which picture below can form the pyramid shown on the right?



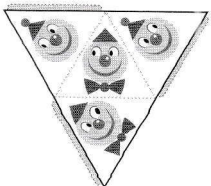
A



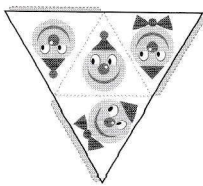
B



C



D



E

Section B (Correct answer – 4 points | Incorrect or No answer – 0 points)

When an answer is a 1-digit number, shade "0" for the tens, hundreds and thousands place.

Example: if the answer is 7, then shade 0007

When an answer is a 2-digit number, shade "0" for the hundreds and thousands place.

Example: if the answer is 23, then shade 0023

When an answer is a 3-digit number, shade "0" for the thousands place.

Example: if the answer is 785, then shade 0785

When an answer is a 4-digit number, shade as it is.

Example: if the answer is 4196, then shade 4196

Question 16

What is the sum of the first 30 numbers of the following pattern?

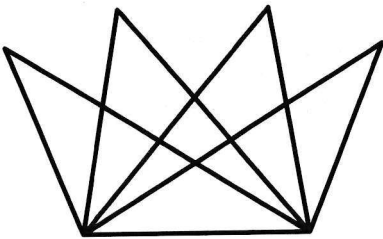
50, 49, 48, 47, 46 ...

Question 17

If you increase the length of a rectangle by 12 cm, you will get a rectangle with a perimeter of 38 cm. What is the perimeter of the original rectangle?

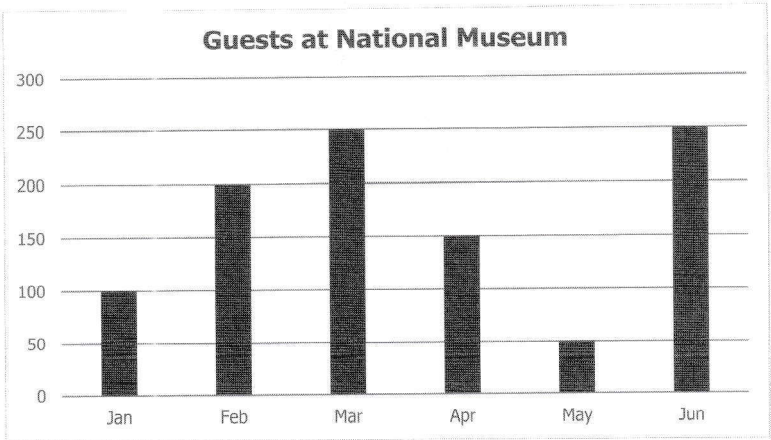
Question 18

How many triangles are there in the figure below?



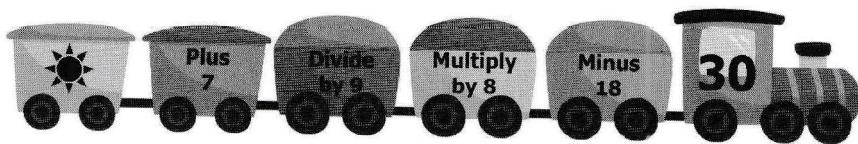
Question 19

The graph below shows the number of guests who visited the National Museum in the first six months of 2019. How many people visited the museum during the six months?



Question 20

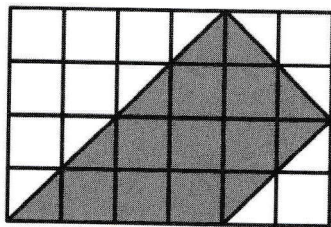
Study the picture below.



Find the value of .

Question 21

If the area of the rectangle is 96 cm^2 , what is the area (in cm^2) of the shaded region?



Question 22

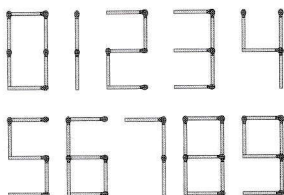
Brad bought 2 boxes of chocolates, 3 packets of sweets and 4 baskets of fruits at \$29. A box of chocolates and a packet of sweets cost \$4. A packet of sweets and a basket of fruits cost \$6. How much does a box of chocolates cost?

Question 23

Diana made number 2020 using 22 matchsticks as shown below. How many digits are there in the largest possible whole number that she can construct using exactly 17 matchsticks?

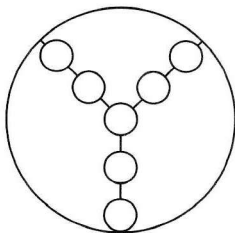


(The figures of all the digits from 0 to 9 are shown below.)



Question 24

The numbers 2, 5, 8, 11, 14, 17 and 20 can be placed in the 7 circles below such that the sum along each straight line is the same and each number can only be used once. What is the largest possible value of this sum?



Question 25

In the following, all the different letters stand for different digits.

$$\begin{array}{r}
 P P P \\
 + Q Q Q \\
 \hline
 R Q Q R
 \end{array}$$

Find the value of the 4-digit number RQQR.

END OF PAPER

Solutions to SASMO 2019 Primary 3 (Grade 3)

Question 1




Group the numbers and calculate.




$$(7 - 7) + (16 - 6) + (34 - 4) + (45 - 15) + 50 = 0 + 10 + 30 + 30 + 50 = \mathbf{120}$$




Answer: **(B)**

Question 2

The pattern is as follows:

1 st circle	4 th circle	7 th circle
		
1 black & 1 white circles	2 black & 2 white circles	3 black & 3 white circles

2 nd circle	5 th circle	8 th circle
		
10 black circles	8 black circles	6 black circles

3 rd circle	6 th circle	9 th circle
		
2 white circles	3 white circles	4 white circles

Hence the 10th circle must have **4 black** & 4 white circles.

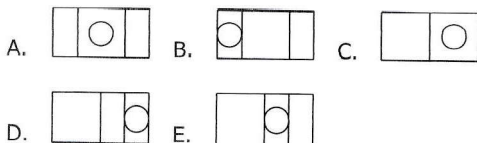
Answer: **(D)**

Question 3

The smallest possible sum that can be obtained is $1 + 1 + 1 = 3$ and the largest sum is $6 + 6 + 6 = 18$. Thus, it is impossible to get the sum **22**.

Answer: **(D)**

Question 4



All the options, except C, have 4 vertical lines whereas the top view of the figure has 3 vertical lines. The answer is **Option C**.

Answer: **(C)**

Question 5

Mitchell finishes second, one place behind the winner. So, the winner finishes one place ahead of Mitchell. Mark is not the winner as he finishes one place ahead of Jason. Hence the winner is **Tom**.

Answer: **(C)**

Question 6

The following table shows the different combinations:

Blue	√	√								
White			√	√						
Yellow					√	√				
Black							√	√		
Red									√	√
2-door	√		√		√		√		√	
4-door		√		√		√		√		√

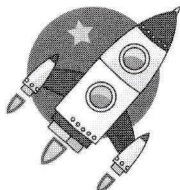
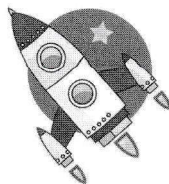
For instance, the first combination (2nd column) is a blue 2-door car, and the second combination (3rd column) is a blue 4-door car.

In total, **10** different versions of the car are available.

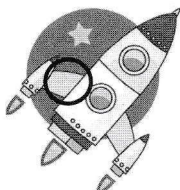
Answer: **(A)**

Question 7

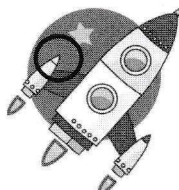
The circled spots are different from the mirror image of the picture on the right.



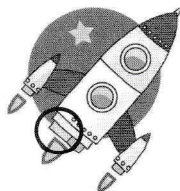
A



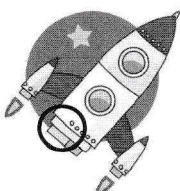
B



C



D



E

Answer: (A)

Question 8

Using the divisibility test for 3, the sum of the digits $3 + 2 + 9 + B = 14 + B$ is divisible by 3. Since B is a single digit, $B = 1, 4$ and 7 . But since B is even, $B = 4$.

Answer: (C)

Question 9

In the second air balloon:

1 cat + 1 sheep \rightarrow 5 balloons

In the first air balloon:

1 cat + 1 sheep + 2 dogs \rightarrow 11 balloons

5 balloons 6 balloons

1 dog $\rightarrow 6 \div 2 = 3$ balloons

1 cat + 1 sheep + 1 dog $\rightarrow 5 + 3 = 8$ balloons

Answer: (A)

Question 10

Case 1: They watched Four Princesses first.

The earliest time they can watch Four Princesses is 10:00. They finish at 11:55 and continue with Dragon Fighter at 14:10. The earliest time they could finish watching both movies is 15:55.

Case 2: They watched Dragon Fighter first.

The earliest time they can watch is 10:55 since they missed the first session at 9:00. They finish at 12:40 and continue with Four Princesses at 13:55. The earliest time they could finish watching both movies is **15:50** which is earlier than 15:55.

Answer: (C)

Question 11

The pattern is as follows:

In the first row, the third image is formed by combining the second image with the first and removing the smallest circle.

In the second row, the third image is formed by combining the second image with the first and removing the smallest circle.

Following the same pattern in the third row, we combine the second image with the first and remove the smallest circle. Thus, **Option B** will be the missing shape.

Answer: (B)

Question 12

Draw a table and count the number of squares and sides in each figure.

Figure	No. of squares	The largest area	No. of sides	The largest perimeter
1	10		16	
2	12	✓	16	
3	8		24	✓
4	11		16	

Figure 2 has the largest area as it is made up of the greatest number of squares.

$$\text{Area of each identical square} = 48 \text{ cm}^2 \div 12 = 4 \text{ cm}^2$$

$$\text{Length of each identical square} = 2 \text{ cm}$$

Figure 3 has the largest perimeter because it has the most number of sides (24) compared to the other three figures (16).

$$\text{Perimeter of Figure 3} = 24 \times 2 \text{ cm} = \mathbf{48 \text{ cm}}$$

Answer: **(D)**

Question 13

The following table shows the numbers pages read in the first 2 weeks.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
					102	100
98	96	94	92	90	88	86
84	82	80	78	76	74	

Notice from the table above that Diana read 14 pages less every week.

Next Saturday, Diana read $102 - 14 = 88$ and the following Saturday, she read $88 - 14 = 74$.

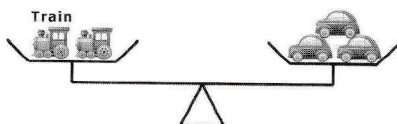
She read $74 - 14 - 14 - 14 - 14 - 14 = 4$ pages on **Saturday**.

Answer: **(E)**

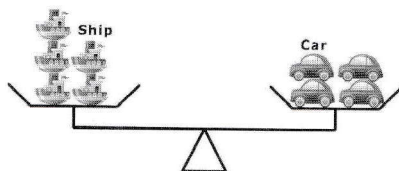
Question 14

If a number can be divided by both 2 and 3, then it can be divided by 6. The largest two-digit number that can be divided by 6 is 96, which is the 16th multiple of 6. In other words, there are 16 numbers less than 100 which can be divided by 6. However, these 16 numbers include the one-digit number '6'. Thus, there are only $16 - 1 = 15$ two-digit numbers that can be divided by both 2 and 3 at the same time.

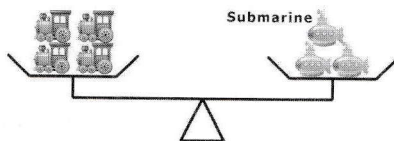
Answer: (C)

Question 15

A train is heavier than a car since 2 trains are needed to balance 3 cars.



A car is heavier than a ship since 4 cars are needed to balance 5 ships.



A submarine is heavier than a train since 3 submarines are needed to balance 4 trains.






Arranging from the lightest to the heaviest

Ship – Car – Train – Submarine,

we find that Submarine is the heaviest among the different types of toys.

Answer: (B)

Question 16

Type of Rectangle	1-part	2-part	3-part	4-part
Example				 or 
Quantity	16	10	1	3

Total = $16 + 10 + 1 + 3 = 30$ rectangles

Answer: **30**

Question 17

The operator \odot performs the following:

Step 1: It multiplies the number on the left by 2.

Step 2: It multiplies the difference between the two numbers by 2. Then product is placed next to the number obtained in step 1

We can see that the operator \odot satisfies all the equations in the question.

Therefore, $6 \odot 12 = (2 \times 6)(2 \times (12 - 6)) = 1212$.

Answer: **1212**

Question 18

Initially, the 5 siblings had $24 \times 6 = 144$ muffins altogether.

Then, their mom distributed $144 \div 4 = 36$ muffins to 4 of them and Eddie has 36 muffins now.

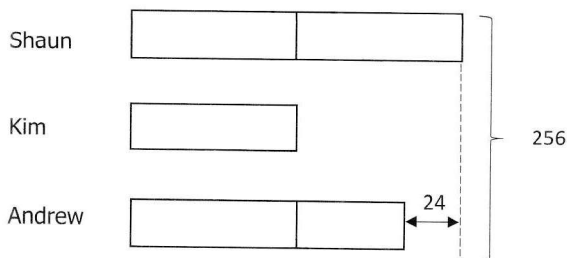
From the picture graph, Eddie had $4 \times 6 = 24$ muffins at first.

Eddie has $36 - 24 = 12$ more muffins now than before.

Answer: **12**

Question 19

Using the Model Method, let the number of stamps Kim has be 1 unit. Then Shaun has 2 units and Andrew has 24 less than 2 units.



$$5 \text{ units} = 256 + 24 = 280$$

$$1 \text{ unit} = 280 \div 5 = 56$$

Andrew has $56 + 56 - 24 = \mathbf{88 \text{ stamps.}}$

Answer: **88**

Question 20

$$\square \times 6 + 13 - \square = 17 + 46$$

$$\square \times 6 - \square + 13 = 17 + 46 = 63$$

$$\square \times 5 + 13 = 63$$

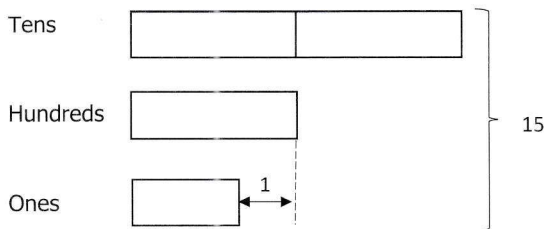
$$\square \times 5 = 63 - 13 = 50$$

$$\square = 50 \div 5 = \mathbf{10}$$

Answer: **10**

Question 21

Using the Model Method, let the digit in the hundreds place be 1 unit. Then the digit in the tens place is 2 units and the one digit is 1 less than 1 unit.



$$4 \text{ units} = 15 + 1 = 16$$

$$1 \text{ unit} = 16 \div 4 = 4$$

Hence the hundreds digit is 4, the tens digit is $4 + 4 = 8$, and the ones digit is $4 - 1 = 3$. The number is **483**.

Answer: **483**

Question 22

The largest number of adults could be is $\$88 \div \$8 = 11$. However, no ticket could be bought for the remaining $\$90 - \$88 = \$2$.

The following table shows whether \$90 can be spent when the number of adults is 10 or less.

No. of adults	Total cost of adults' tickets	The remaining money	Children's ticket
10	$\$8 \times 10 = \80	$\$90 - \$80 = \$10$	All \$10 cannot be spent.
9	$\$8 \times 9 = \72	$\$90 - \$72 = \$18$	All \$18 cannot be spent.
8	$\$8 \times 8 = \64	$\$90 - \$64 = \$26$	All \$26 cannot be spent.
7	$\$8 \times 7 = \56	$\$90 - \$56 = \$34$	All \$34 cannot be spent.
6	$\$8 \times 6 = \48	$\$90 - \$48 = \$42$	all $\$42 \div \$7 = 6$ can be spent

Answer: **6**

Question 23

Number of digit '1's in the ones places: 1, 11, 21, 31, 41, 51, 61, 71, 81, 91, 101, 111, 121 – 13 numbers

Number of digit '1's in the tens places: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 – 20 numbers

Number of digit '1's in the hundreds place: 100, 101, 102, ..., 129, 130 – 31 numbers

Total: $13 + 20 + 31 = \mathbf{64}$

Answer: **64**

Question 24

Let us label the empty boxes with A, B, C, D, E and F.

A must be greater than 7 since $7 \times A$ is greater than 53. Then $B = A \times 2$ is greater than $7 \times 2 = 14$, and D is less than $53 - 14 = 39$. If $D = 7 \times C$ is less than 39, then C is less than $39 \div 7 = 5$.

From $A \times 7 - 2 \times C = 53$, A must be less than 10; otherwise, C will be greater than 5. Hence $A = 8$ or 9.

$A = 8$ doesn't have any solutions.

If $A = 9$, then $C = 5$ and $F = \mathbf{10}$.

Answer: **10**

$$\begin{array}{rcccl}
 \boxed{A} & \times & \boxed{2} & = & \boxed{B} \\
 \times & & \times & & + \\
 \boxed{7} & \times & \boxed{C} & = & \boxed{D} \\
 = & & = & & = \\
 \boxed{E} & - & \boxed{F} & = & \boxed{53}
 \end{array}$$

Question 25

A must be 1; otherwise, $(2BBB - CCC), (3BBB - CCC), \dots, (9BBB - CCC)$ will be greater than 1000.

Rewrite the subtraction as addition.

$$\begin{array}{rcccc} & & C & C & C \\ + & & & & A \\ \hline & A & B & B & B \\ \hline \end{array}$$

Since $A = 1$, then $C = 9$ and $B = 0$.

$$A + B + C = 1 + 0 + 9 = \mathbf{10}$$

Answer: **10**

Solutions to SASMO 2020 Primary 3 (Grade 3)

Question 1

Pairing numbers to make tens or hundreds:

$$902 + 508 = 1410$$

$$804 + 106 = 910$$

$$609 + 201 = 810$$

$$403 + 307 = 710$$

$$\text{Sum} = 1410 + 910 + 810 + 710 + 700 = \mathbf{4540}$$

Answer: **(B)**

Question 2

$$5 \text{ tens } 5 \text{ ones} = 5 \times 10 + 5 = 55$$

$$2 \text{ tens } 8 \text{ ones} = 2 \times 10 + 8 = 28$$

$$55 - 28 = \mathbf{27}$$

Answer: **(A)**

Question 3

The same pattern repeats in each row of 3 figures but in different orders as illustrated in the table below:

Part	Pattern
Hair	1, 2, 3
Mouth	smiley, sad, horizontal

So, the missing figure should be **Option C** which has 1 hair and a smiley face.

Answer: **(C)**

Question 4

Every one week or 7 days later will return to the same day.

Alice wants to throw a party on her 40th day or 39 days later in the club.

$39 \div 7 = 5R4$ means that 39 days later will be 5 weeks and 4 days after Tuesday.

5 weeks after Tuesday is still Tuesday and 4 days after Tuesday is **Saturday**.

Answer: **(B)**

Question 5

From 1 to 100, there are 16 ($100 \div 6 = 16R4$) multiples of 6.

From 1 to 14, there are 2 (6 and 12) multiples of 6.

Thus, there are $16 - 2 = 14$ multiples of 6 between 14 and 100.

Answer: **(C)**

Question 6

Let us count the cubes on each stack from left to right.

There are 3 cubes in the 1st stack.

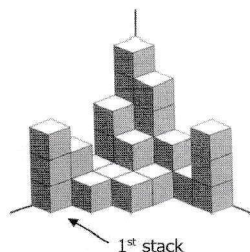
There are 3 cubes in the 2nd stack.

There are 3 cubes in the 3rd stack.

There are 6 cubes in the 4th stack.

There are $5 + 4 + 2 + 1 + 3 = 15$ cubes in the 5th stack.

In total, there are $3 + 3 + 3 + 6 + 15 = 30$ cubes.



Answer: **(B)**

Question 7

Emily arrived at the cinema 17 minutes after 3.55 pm, which is 4.12 pm. There are 2 hours or 120 minutes from 1.47 pm to 3.47 pm. There are 25 minutes from 3.47 pm to 4.12 pm. Thus, Emily's journey from her house to the cinema was $120 + 25 = 145$ minutes long.

Answer: **(E)**

Question 8

The pattern is as follows:

$$1 \xrightarrow{+2} 3 \xrightarrow{+4} 7 \xrightarrow{+8} 15 \xrightarrow{+16} 31 \xrightarrow{+32} 63,$$

where each addition is twice the previous one.

The next number in the sequence is **63**.

Answer: **(A)**

Question 9

According to the Divisibility Rule of 3, 3P78 is divisible by 3 if the sum of its digits $3 +$

$P + 7 + 8 = 18 + P$ is divisible by 3. The multiples of 3 are

3, 6, 9, 12, 15, 18, 21, 24, 27, 30

$$18 + P = 18 \rightarrow P = 0$$

$$18 + P = 21 \rightarrow P = 3$$

$$18 + P = 24 \rightarrow P = 6$$

$$18 + P = 27 \rightarrow P = 9$$

There are **4 possible values** for P.

Answer: **(A)**

Question 10

The first 31 counting numbers are:

1, 3, 5, 7, 9,

11, 13, 15, 17, 19,

31, 33, 35, 37, 39,

51, 53, 55, 57, 59,

71, 73, 75, 77, 79,

91, 93, 95, 97, 99

111

Thus, the 31st counting number is **111**.

Answer: **(B)**

Question 11

The heaviest boy is 53 kg heavy, which is an odd-numbered weight.

Mason's weight is an even number, so he is not the heaviest.

Joshua's weight is a multiple of 5 which is 45 kg. So, he is not the heaviest.

Christopher is not the heaviest as per the statement.

Thus, the remaining boy, **Mateo** is the heaviest.

Answer: **(D)**

Question 12

They paid altogether $\$20 + \$15 + \$5 = \40 for 120 oranges.

$\$40 \rightarrow 120$ oranges

$\$1 \rightarrow 120 \div 4 = 3$ oranges

John paid $\$15 \rightarrow 15 \times 3 = 45$ oranges

Answer: **(C)**

Question 13

Tank + 200 litres of water = 350 kg

Tank + 150 litres of water = 315 kg

Subtracting the equations above: 50 litres of water = 35 kg

150 litres of water = $35 \text{ kg} \times 3 = 105 \text{ kg}$

Tank + 150 litres of water = Tank + 105kg = 315 kg

Thus, Tank = $315 \text{ kg} - 105 \text{ kg} = \mathbf{210 \text{ kg}}$

Answer: **(D)**

Question 14

There are $132 \div 11 = 12$ gaps among all the lanterns on each side of the river.

There are $12 + 1 = 13$ lanterns on each side of the river.

Thus, there are $13 \times 2 = 26$ lanterns in total.

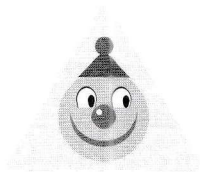
Answer: (D)

Question 15

Let us describe the two faces of the pyramid.

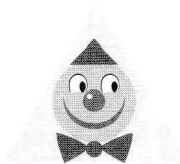
Face 1:

- It has a dot on top of its hat
- It has a white dot on the left of its nose.
- Its eyes look to the right.

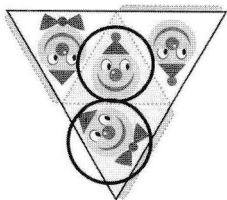


Face 2:

- It doesn't have a dot on top of its hat.
- It has a white dot on the left of its nose.
- Its eyes look to the right.
- It has a bow tie.



Only **Option B** has both faces.



Answer: (B)

Question 16

We notice that the 2nd number is $(50 - 1)$, the third number is $50 - 2$ and so on.
Hence the 30th number is $50 - 29 = 21$ and the sum is

$$\begin{aligned} &50 + 49 + 48 \dots \dots + 23 + 22 + 21 \\ &= (50 + 21) + (49 + 22) + (48 + 23) + \dots + (36 + 35) \\ &= 71 \times (30 \div 2) \\ &= 71 \times 15 \\ &= \mathbf{1065}. \end{aligned}$$

Answer: **1065**

Question 17

A rectangle has 2 lengths and 2 widths.

When the length of the rectangle is increased by 12 cm for each side, its perimeter is increased by $12 \times 2 = 24$ cm.

So, original perimeter + 24 cm = 38 cm

Working backwards: original perimeter = $38 \text{ cm} - 24 \text{ cm} = \mathbf{14 \text{ cm}}$

Answer: **14**

Question 18

1-part: 7 triangles

2-part: 10 triangles

3-part: 6 triangles

4-part: 5 triangles

6-part: 2 triangles

Total number of triangles = $7 + 10 + 6 + 5 + 2 = \mathbf{30}$

Answer: **30**

Question 19

According to the diagram, there are 2 units of guests in January, 4 units in February, 5 units in March, 3 units in April, 1 unit in May and 5 units in June.

In total, there are $2 + 4 + 5 + 3 + 1 + 5 = 20$ units

As each unit represents 50 guests, $20 \text{ units} = 20 \times 50 = 1000$ guests.

Answer: **1000**

Question 20

Working backwards, we reverse all operations to obtain the unknown number



$$30 + 18 = 48$$

$$48 \div 8 = 6$$

$$6 \times 9 = 54$$

$$54 - 7 = 47$$

Answer: **47**

Question 21

There are 6 squares along the length and 4 squares along the width. So, the rectangle is made of altogether $6 \times 4 = 24$ squares.

Area of each square = $96 \text{ cm}^2 \div 24 = 4 \text{ cm}^2$

The shaded region comprises of 8 squares and 8 half square triangles. The 8 half square triangles can be combined to 4 squares. Thus, the shaded region comprises of $8 + 4 = 12$ squares.

Area of shaded region = Area of 12 squares = $12 \times 4 = 48 \text{ cm}^2$

Answer: **48 cm^2**

Question 22

It is given that

$$\begin{aligned}\$29 &= 2 \text{ boxes of chocolates} + 3 \text{ packets of sweets} + 4 \text{ baskets of fruits} \\ &= 2 \text{ boxes} + 3 \text{ packets} + 4 \text{ baskets} \\ &= 2 \text{ boxes} + 2 \text{ packets} + 1 \text{ packet} + 1 \text{ basket} + 3 \text{ baskets} \\ &= 2 \times (1 \text{ boxes} + 1 \text{ packet}) + (1 \text{ packet} + 1 \text{ basket}) + 3 \text{ baskets} \\ &= 2 \times \$4 + \$6 + 3 \text{ baskets} = \$14 + 3 \text{ baskets}.\end{aligned}$$

Hence

$$3 \text{ baskets} = \$29 - 14 = \$15 \text{ or } 1 \text{ basket} = \$15 \div 3 = 5$$

$$1 \text{ packet} = \$6 - \$5 = \$1 \text{ and } 1 \text{ box} = \$4 - \$1 = \$3.$$

Answer: **\$3**

Question 23

To obtain the largest possible whole number, Diana needs to construct as many digits as possible. The digit '1' requires the least number of matchsticks which is 2. The digit '7' requires the second least number of matchsticks which is 3. Thus, the largest possible number that she can construct using exactly 17 matchsticks is 71,111,111.

The number 71,111,111 contains **8 digits**.

Answer: **8**

Question 24

There will be a total of 3 sums in this figure, and these 3 sums have the same value.

Hence, the total value of the 3 sums in the figure = $3 \times (\text{sum of each straight line})$, which must be a multiple of 3.

On the other hand, the total value of the 3 sums in the figure can also be equal to the sum of all 7 numbers in the question + 2 times of the middle number

$$= 77 + 2 \times (\text{middle number}).$$

Thus, $77 + 2 \times \text{middle number} = (\text{sum of each straight line}) \times 3$

Hence, to obtain the greatest sum, the middle number must be of the greatest possible value such that $(77 + 2 \times \text{middle number})$ is a multiple of 3. The largest number in the question is 20, and the greatest possible sum is $77 + 2 \times 20 = 117 = 3 \times 39$.

One possible arrangement is (2, 14, 20), (5, 14, 20) and (8, 11, 20).

Answer: **39**

Question 25

A three-digit number plus a three-digit number can only result in a four-digit number that starts with 1. Hence R must be 1.

In ones place addition, the last digit of $P + Q$ is 1 which means that $P + Q = 11$ since $P + Q$ is greater than 1.

Then in tens place addition $P + Q = 11$ and there is a carryover of 1 from the ones place addition. Thus, $Q = 2$ and RQQR is **1221**.

Answer: **1221**